NATALITY AND FECUNDITY

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A CONTRIBUTION TO NATIONAL DEMOGRAPHY

BY

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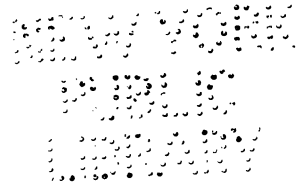

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PREFACE

We are in the fortunate position of having in our possession data of national demography as yet unpublished. In this book we have endeavoured to utilise, more fully than has yet been attempted, the valuable statistics of the natality of Scotland contained in the birth registers for the year 1855, and interned in the Register House in Edinburgh. We desire to record our thanks to Sir Stair Agnew, K.C.B., Registrar-General of Scotland, for permission to make a general search in the birth registers for 1855. We acknowledge with gratitude the courtesy of the Staff of the General Registry Office, and more especially that of the late R. J. Blair Cunynghame, Esq., M.D., F.R.C.S., Superintendent of Statistics, and of D. Stewart, Esq., I.S.O., the Secretary and Chief Clerk. The work accomplished was arduous, but has resulted in the extraction of figures capable of comparison with those recently published in various countries on the European Continent, and in New

South Wales. For the accuracy of the extracts, for their arrangement, and for the subsequent calculations based upon them, as well as for the tabulations and comparisons instituted, we are alone responsible.

C. J. L.
J. N. L.

EDINBURGH, *November* 1905.

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CHAPTER I

INTRODUCTION

THE birth registers of Scotland for the year 1855 are unique in Great Britain for their comprehensive detail; indeed, so laborious was the work of entry, that in the succeeding year the schedule was considerably restricted. Although these registers have yielded in the past much interesting information, no attempt has been made to fully utilise all the data obtainable from them. In the reports of the Registrar-General of Scotland may be found many facts obtained from these registers, and, in addition, Dr Matthews Duncan analysed some of the figures relating to Edinburgh and Glasgow. The latter observer published, in his book on *Fertility, Fecundity, and Sterility* (1871), the results of his partial examination of the registers relating to these two cities.

The Scottish birth registers of 1855 contain the following facts with regard to each birth :—

As to the child—(1) name; (2) sex; (3) year, day of month, and hour of birth; (4) where born.

As to the father—(1) name, rank, profession or occupation, age, and birthplace; (2) date and place of marriage; (3) issue, living and deceased.

As to the mother—(1) name, maiden name, age, birthplace; (2) number of children, and order of birth of registered child.

They also contain the signatures of the informant and of the registrar.

This schedule for 1855 was considerably modified in 1856, and omitted particulars as to the age and birthplace, the date and place of marriage, and the issue living and deceased of the father; also the age and birthplace of the mother, the number of her children, and the order of birth of the registered child.

In 1861 the schedule was again altered, and it contained in that and subsequent years the date and place of marriage, but the ages of the parents and the number of their children were still omitted.

The loss sustained by the science of vital statistics in this alteration of schedule is incalculable, so valuable would the information have been had it extended over a series of years. Even the statistics of a single year may, however, be fruitful, and for this reason foreign writers, such as Körösi, publicly deplore the fact that no full analysis of these figures has yet been published. Probably the expense in money, time, and labour entailed in such an analysis has deterred many from attempting it. With the view of removing, at all events in part, this reproach, and with the hope of amplifying the results of Matthews Duncan, this research has been undertaken by us.

The method of research has been as follows :—

Extraction of full particulars regarding each birth registered in 1855.—For this purpose the services of a clerk were secured, and the work of transcription occupied six hours daily for a period of ten months. 100,000 cards were prepared with columns to show the following particulars :—(1) Number of district, (2) the number of the birth in the register of the district, (3) sex of child, (4) date of birth, (5) occupation of father, (6) age of father, (7) date of marriage, (8) previous issue, (9) order of birth, (10) age of mother.

It was the duty of the clerk to fill in one card for each birth. In order to ensure that there should be no error of transcription, every card and each detail on the card were then separately verified by comparison with the register by one of us (C. J. L.). This work involved a large amount of time and labour, but was quite necessary to ensure accuracy. The verified cards were submitted to sorting and enumeration, the results of which will be found in the various tables subjoined. On the completion of transcription, it was found that the number of cards exceeded the recorded number of births. This was caused by occasional registration of the same birth in more than one district in pursuance of the provisions of section 26 of the first Registration Act (17 and 18 Vict. cap. 80). Consequently in some cases there were two cards for only one birth. The registers and cards were again compared, and one of the cards for each such double entry cancelled before enumeration. On the whole

our total figure (93,369) corresponds with almost complete exactitude with the revised figures (93,363) published by the Registrar-General. The first official report placed the number of births in 1855 as 93,349, but a later analysis, published in 1874, disclosed the actual number as 93,363. The difference is due to the fact that 1855 was the first year of registration, and a few slight inaccuracies, inseparable from the inception of a new system, crept into the registers. Further, in many of the registers the entries of particulars are difficult to decipher, and it is therefore not surprising that our analysis of so large a mass of material should not in all points coincide with the officially declared figures. In no case is the discrepancy sufficiently large to materially alter the deductions drawn from the data disclosed.

Amongst the subjects upon which these figures might be expected to throw light are fertility, fecundity, masculinity, and the duration of the interval between marriage and the birth of a first child. The total births with which we had to deal being 93,369, the first duty was to separate legitimate and illegitimate births. We counted 85,964 legitimate, and 7405 illegitimate. The legitimate were then further divided into male and female—viz., 44,010 male, and 41,954 female — and these were further sorted according to the ages of the parents. A comprehensive table was then prepared, showing for each combination of ages of the parents the number of births of each sex, and differentiating between first and subsequent births. This table forms the basis of

our figures, but it is not necessary to reproduce it in full.

The first births have been subjected to special analysis, since information of particular value is obtainable from them. Special tables were prepared dealing with plural births, and showing their incidence according to the order of birth, the ages of the parents, and the sex of the children.

It must be remembered that stillbirths are not registered, and that the registered births therefore include only living children. Most of these would be born at or near the full time of pregnancy, being at any rate children of ascertained viability. This detail is important in connection with any comparison of these figures with those of other countries in which stillbirths are registered and counted. In investigating the natality, fecundity, and fertility of any population, it is advisable to include both parents in the examination, and not to base conclusions on the female sex alone. We therefore insist explicitly on the fact that the following figures show results which are (1) national, in contrast to local; (2) bisexual, or bigenous, in contrast to monogenous; (3) annual, in contrast to the limited periodic characters of some of the results with which comparison may be made.

The illegitimate births were likewise divided according to sex, and sorted out according to the age of the mother. In very few cases was the name of the father registered or his age stated, so that it was necessary to arrange these births solely in relation to the mother's age. The 7405 births were composed

of 3791 males and 3614 females. An analysis of the plural illegitimate births included in these figures was also prepared. Stillborn illegitimate children are not included, since these are not registered.

Our figures of illegitimate births exceed by 48 those published by the Registrar-General. This may possibly be due to double registration. It was not so easy to detect this in the case of illegitimate children as in the case of legitimate children, since the details stated are not so full as in the latter case. Whereas in the case of the legitimate children it was usually possible to fill in nearly all the columns of the card, in the case of illegitimate children the card generally showed only the sex of the child, the date of birth, and the age of the mother.

Population.—Since population forms the basis of all vital statistics, it is advisable to state here that the populations in the succeeding chapters are all calculated to the middle of the year 1855. For this purpose the census figures for the years 1851 and 1861 were taken, and by means of these the population living in each group of ages was calculated to the middle of the year 1855, on the assumption that the increase was in geometrical progression.

When marriages are dealt with, it has been necessary to use those registered in 1855, no earlier figures being available. We must point out, however, that in the first year of registration the numbers of women married at various ages do not exhibit the same relative proportions to one another as in subsequent years. For instance, the brides aged 15-19

constituted over 15 per cent. of the total as against an average of 12 per cent. Those aged 20-24, on the contrary, formed only 41 per cent. of the total as compared with an average figure of 45 per cent. The result is, that calculations based upon the marriages of 1855 show an unduly high fecundity, and a correspondingly low sterility, in the case of brides aged 20-24. Nevertheless we have given the results as ascertained, and without correction or adjustment for this abnormality. This accounts for certain of the irregularities which will be met with throughout the tables, and which may likewise be seen in the figures published by Matthews Duncan.

Definition of terms.—It will be well here to set down clearly the definition of certain terms which will recur frequently throughout the succeeding chapters, such terms, *e.g.*, as fertility, fecundity, and isogenes.

Fertility and fecundity.—No two terms are more frequently confounded than fertility and fecundity. Yet they are not the same, but denote different aspects of reproductive ability. In the estimation of the fertility of any population, all the births produced in a given time by that population are included. That is to say, that twin and triplet births are counted as two and three respectively and not as one birth transaction. On the other hand, in the estimation of fecundity the birth transactions alone are the subject of consideration, and plural births have no more weight than single births. In short, the terms fertility and fecundity both refer to the ascertained fact of productivity; but whereas fertility means the

quantity of ascertained productiveness, fecundity means the quality of ascertained productiveness.

Isogenes show equalities in the probability of a birth. They refer to all possible combinations of ages of the parents. They indicate the different combinations of ages of the parents which show equal probability of a birth within a year. The probability is stated as a percentage of the married couples. Thus all the combinations of parental ages which show thirty annual births for every hundred married couples belong to the isogene of thirty.

CHAPTER II

LEGITIMATE BIRTHS. PARENTAL AGES

DEALING first with the 85,964 legitimate births of living children, it is proposed to show the ages of the parents and their actual fertility at different ages.

Female parents.—The 85,964 births were the offspring of 84,971 wives, and Table I. shows the age distribution of those wives whose children were registered

TABLE I.—*Showing the Age of each of* 84,971 *Wives whose Children were registered in Scotland in* 1855.

Age.	Wives-Mothers.	Age.	Wives-Mothers.	Age.	Wives-Mothers.
15	3	30	5751	45	419
16	23	31	3307	46	189
17	132	32	4307	47	85
18	475	33	3603	48	62
19	1015	34	3588	49	18
20	1809	35	4008	50	16
21	2361	36	3367	51	5
22	3594	37	2584	52	7
23	3769	38	2782	53	1
24	4540	39	2004	54	3
25	4742	40	2492	55	2
26	4853	41	1199	56	1
27	4591	42	1235	57	1
28	5408	43	724	58	2
29	4299	44	583	Not stated	1012

in Scotland in the year 1855. The year of age showing the largest number of wives-mothers is 30-31, for the age of the mother at birth of the child is age at last birthday. The table shows that more wives-mothers return their age as 30 than as any other age, but does not prove that this is the year of age at which more children are born than any other year. The fact that the greatest number of wives-mothers state their age at 30 may be in part due to the fact that there is a tendency, seen also in all census returns, for population to group itself around certain ages such as 30, 40, etc. This is supported by the great fall in the numbers between the ages 30 and 31, and the ages 40 and 41. Reference to the table shows that at the ages 28 and 38 the numbers of wives-mothers much exceed those at 29 and 39, whilst the numbers at 30 and 40 much exceed those at 29 and 31 and at 39 and 41. It is not at all improbable, in fact, that the maternal age of 28 really represents the age at which the largest number of wives-mothers add to the population.

A considerable number of cards (1012) show that the age of the mother was not stated in the register. In subsequent tables these "not stateds" have been proportionally distributed amongst the individual groups of ages.

The mean age of 83,959 wives-mothers whose ages are stated is 30.578. This figure is determined thus: the sum of the years lived by 83,959 wives-mothers is divided by the number living, viz., 83,959, and the result is 30.078. To this is added .5, since on the average the age stated will be less by half a year

than the period actually lived. Since the age 30 shows the greatest number of wives-mothers, it is interesting to compare the numbers of wives-mothers above and below this age. For this purpose Table II. has been prepared. It shows that the per-centage below 30.5 years is roughly 53, and above 30.5 years is 47, a difference of 6 per cent. This figure is arrived at by dividing equally those at 30

TABLE II.—*Scotland*, 1855. *Age of* 83,959 *Wives-Mothers whose Ages are stated.*

		Per cent.
Mean Age . . .	30.578	100.00
Under 30.5 years . .	44,490	52.99
Over 30.5 years . .	39,469	47.01
Difference . .	5,021	5.98

years and adding up the numbers respectively above and below 30.5, omitting those "not stated."

Matthews Duncan, dealing with the registers of Edinburgh and Glasgow in the same year, states that three-fifths of the wives-mothers are below 30.5 and only two-fifths above 30.5. This gives a difference of 20 per cent.—a great difference from our figure of 6 per cent. The reason for the discrepancy in results is one which modifies all Duncan's figures, and will be brought out also in other tables. It depends upon the fact that the age constitution of towns differs from

that of rural districts and from that of the whole country. It is to be expected that cities like Edinburgh and Glasgow contain proportionally more young mothers than the whole country. The difference between our results and those of Duncan is therefore in a direction that might be expected. This shows the advantage in these matters in dealing with national as contrasted with urban statistics.

The difference in percentage is even more forcibly brought out if we compare the actual figures. The wives-mothers under 30.5 exceed those over 30.5 by 5021, and of this number 3115 are accounted for in Edinburgh and Glasgow, although the wives-mothers in the whole country numbered 84,971 and those of Edinburgh and Glasgow only 16,301. The conclusion of Matthews Duncan, that "at least three-fifths of the population are recruited from women not exceeding 30 years of age," is not supported by the figures of the whole country for the same year. It is true that there are more mothers under 30.5 than over 30.5. The climax of actual fertility of the married female population may be stated at 30 years according to Table I., with a reservation in regard to the possibility of the actual climax occurring at the age of 28 years.

The child-bearing wives of 1855 whose ages are stated, vary in age from 15-58 years. They have been arranged in quinquennial groups in Table III., which also shows the percentage of the whole wives-mothers at each group of ages.

The table shows that over 28 per cent. of the wives-mothers were in the quinquennium of age 25-29, and over 24 per cent. in that of 30-34. The decade 25-34 furnishes over 52 per cent. of the whole child-bearing wives. The quinquennia on either side of this decade furnish together over 36 per cent., whilst from the fortieth year onwards only a little over 8 per

TABLE III.—*Showing the Ages of* 84,971 *Wives-Mothers, arranged in Quinquennial Groups.*

Ages.	Wives-Mothers.	Percentage of Total.	Distribution of Ages not stated.	Total Wives-Mothers.
15—19	1,648	1.94	19	1,667
20—24	16,073	18.92	183	16,256
25—29	23,893	28.12	277	24,170
30—34	20,556	24.20	246	20,802
35—39	14,745	17.35	191	14,936
40—44	6,233	7.33	85	6,318
45—49	773	0.91	11	784
50—54	32	0.03	...	32
55—59	6	0.01	...	6
Not stated	1012	1.19	...	...
...	84,971	...	1,012	84,971

cent. occur, and under 20 years only 2 per cent. Attention should be directed to the very small percentage at ages 45 and over. The table shows that the child-bearing ages of the wives are practically wholly included in the years 15-45. The remaining 1 per cent. represents those whose ages are "not stated." The distribution of these "not stateds" amongst the quinquennial groups is also shown in Table III. The table thus shows the total wives-mothers of Scotland in 1855 arranged in

quinquennial groups at child-bearing ages. These total figures will be used later for various purposes. In dealing next with the number of births attributable to these mothers, Table IV. shows that in the case of 84,942 births the age of the mother at the time of the birth was known. It further shows these 84,942 births arranged in quinquennial groups according to the stated ages of the mothers. There were 1022

TABLE IV.—*Legitimate Children, grouped according to Mothers' Ages.*

Mothers' Ages.	Mother's Age Stated.	Mother's Age Not Stated.	Total.
15—19	1,653	19	1,672
20—24	16,172	185	16,357
25—29	24,142	281	24,423
30—34	20,840	248	21,088
35—39	14,993	193	15,186
40—44	6,324	85	6,409
45—49	778	11	789
50—54	32	...	32
55—59	8	...	8
Total .	84,942	1,022	85,964

births in which the mother's age was not stated, and these are shown in the next column of the table, distributed proportionally amongst the mothers in each quinquennium. The final column of the table shows the total births during the year attributable to mothers in the various quinquennial groups of ages.

Male parents.—The husbands whose children were registered in Scotland in 1855 numbered 84,971, and varied in age from 17 to 86 years. The

distribution for individual years of age is shown in Table V.

The year of age showing the largest number of husbands-fathers was 30, as in the case of the wives-

TABLE V. — *Showing the Age of each of* 84,971 *Husbands whose Children were registered in Scotland in* 1855.

Age.	Husbands-Fathers.	Age.	Husbands-Fathers.	Age.	Husbands-Fathers.
17	4	41	1737	65	20
18	64	42	1951	66	16
19	258	43	1521	67	15
20	624	44	1488	68	15
21	1240	45	1719	69	10
22	2048	46	1022	70	15
23	2533	47	833	71	...
24	3138	48	772	72	3
25	3684	49	564	73	7
26	3973	50	885	74	4
27	3876	51	325	75	2
28	4568	52	413	76	2
29	4153	53	247	77	...
30	4980	54	265	78	...
31	3248	55	303	79	1
32	4192	56	154	80	1
33	3620	57	100	81	...
34	3597	58	105	82	...
35	4345	59	80	83	1
36	3537	60	106	84	...
37	2784	61	38	85	...
38	2949	62	32	86	1
39	2508	63	33	Not stated	411
40	3806	64	25		

mothers, but the latter at this age exceed the former by 771. Here again one notices the great fall in number at ages 31, 41, 51, and 61 as compared with those returned as 30, 40, 50, and 60. The ages 29, 39, 49, and 59 also show the diminution in numbers as compared with the ages on either side of them.

The explanation is the same as in the case of the wives-mothers.

The number of husbands-fathers who were unable or unwilling to state their age is much less than in the case of the wives-mothers. In Table VII. (p. 18) these are distributed amongst the various groups of ages. The mean age of 84,560 husbands-fathers whose ages are stated is 33.94 years. This figure is determined by dividing 84,560 into the sum of the years lived by these husbands-fathers, and obtaining the figure 33.44. To this is added .5, since on the average the actual age will exceed the stated years by .5. Since the age 30 shows the greatest number of husbands-fathers, we may compare, as in the case of the wives-mothers, the actual numbers above and below 30.5 years, and the percentages represented by these numbers. This is done in Table VI.

TABLE VI.—*Scotland*, 1855. *Age of* 84,560 *Husbands-Fathers whose Ages are stated.*

		Per cent.
Mean Age . . .	33.94	100.00
Under 30.5 years . .	32,653	38.62
Over 30.5 years . .	51,907	61.38
Difference . .	19,254	22.76

This table shows that, contrary to the experience of the mothers recorded in Table II. the fathers above

30.5 exceed those under that age. The actual difference is 19,254, and the difference in percentage is 22.76 per cent. The greater number of the population is recruited, then, from the fathers over 30.5, and from mothers under 30.5. There is no comparison here between the whole country and the two cities, for Duncan confined his investigation to the female sex, and we have not eliminated from those of the whole country the figures for the male parents of the two cities.

Table VII. shows the husbands-fathers arranged in quinquennial periods of age, and the percentage of the total for each quinquennium. The quinquennium 25-29 shows the largest percentage, nearly 24 per cent. of the fathers being of these ages. It is, however, nearly equalled by the next quinquennium, 30-34, which represents 23 per cent. of the total, so that this decade of age 25-34 provides 47 per cent. of the fathers. It is noticeable that this is a smaller percentage than is provided by the same decade in the case of the mothers. Less than one-half per cent. of the fathers fall into the group of "not stateds," and the most prominent features of the other quinquennia are the small percentage under 20 as compared with mothers under 20, and the marked fall in the numbers for ages above 45, and especially for ages above 55. This table also shows the distribution among the groups of those whose ages were "not stated." The table thus provides us with the total husbands-fathers, arranged in quinquennial groups, and furnishes the

TABLE VII.—*Showing the Ages of* 84,971 *Husbands-Fathers, arranged in Quinquennial Groups.*

Ages.	Husbands-Fathers.	Percentage of Total.	Distribution of Ages not stated.	Total Husbands-Fathers.
15—19	326	.38	2	328
20—24	9,583	11.28	45	9,628
25—29	20,254	23.84	98	20,352
30—34	19,637	23.11	93	19,730
35—39	16,123	18.97	81	16,204
40—44	10,503	12.36	51	10,554
45—49	4,910	5.78	25	4,935
50—54	2,135	2.51	11	2,146
55—59	742	.88	3	745
60—64	234	.28	2	236
65—69	76	.09	...	76
70—74	29	.03	...	29
75—79	5	.01	...	5
80—84	2		...	2
85—89	1		...	1
Not stated	411	.48	...	...
...	84,971	...	411	84,971

TABLE VIII.—*Legitimate Children, grouped according to Fathers' Ages.*

Fathers' Ages.	Father's Age Stated.	Father's Age Not Stated.	Total.
15—19	327	2	329
20—24	9,651	45	9,696
25—29	20,444	98	20,542
30—34	19,854	95	19,949
35—39	16,355	83	16,438
40—44	10,676	51	10,727
45—49	4,969	25	4,994
50—54	2,159	11	2,170
55—59	757	3	760
60—64	242	2	244
65—69	77	...	77
70—74	29	...	29
75—79	5	...	5
80—84	2	...	2
85—89	2	...	2
Total .	85,549	415	85,964

figures which are to be used in further investigations.

Table VIII. shows the 85,964 births according to the ages of the fathers, in groups of five years. There were 85,549 births in which the fathers' ages were stated. These are shown in the second column. There were 415 births in which the fathers' ages were not stated, and the third column shows their distribution throughout the groups of ages.

Parents' ages combined.—Table IX. shows the total legitimate births, stated according to the combinations of the parents' ages in quinquennial groups, those in which one or both of the parents' ages were not stated being shown separately. In Table X. the "not stateds" have been distributed among the various groups in proportion to the number already in those groups. These adjusted totals represent the numbers of children born to married couples of different combinations of ages, and provide us with data for use in future chapters.

TABLE IX.—*Total Legitimate Births in Groups.*

Mothers' Ages.	Fathers' Ages.											Totals.
	15—19.	20—24.	25—29.	30—34.	35—39.	40—44.	45—49.	50—54.	55—59.	60 and over.	Not stated.	
15—19	163	1,000	370	76	24	8	5	...	1	...	6	1,653
20—24	133	6,396	6,573	2,003	694	224	57	28	10	4	50	16,172
25—29	22	1,890	10,544	7,122	2,928	960	365	157	49	29	76	24,142
30—34	4	240	2,358	8,518	5,619	2,596	861	408	107	55	74	20,840
35—39	...	27	351	1,758	6,153	3,948	1,702	621	257	122	54	14,993
40—44	...	6	38	184	722	2,708	1,577	733	233	107	16	6,324
45—49	...	2	1	10	29	119	333	174	82	25	3	778
50—54	...	...	1	1	3	1	4	11	9	2	...	32
55—59	...	...	...	...	2	1	...	...	2	3	...	8
Not stated	5	90	208	182	181	111	65	27	7	10	136	1,022
Totals .	327	9,651	20,444	19,854	16,355	10,676	4,969	2,159	757	357	415	85,964

TABLE X.—*Total Legitimate Births in Groups, after Distribution of those with Ages not Stated.*

Mothers' Ages.	Fathers' Ages.										Total.
	15—19.	20—24.	25—29.	30—34.	35—39.	40—44.	45—49.	50—54.	55—59.	60 and over.	
15—19	167	1,015	375	77	24	8	5	...	1	...	1,672
20—24	136	6,486	6,673	2,030	705	227	58	28	10	4	16,357
25—29	22	1,916	10,702	7,221	2,975	975	372	160	50	30	24,423
30—34	4	244	2,395	8,640	5,712	2,636	877	415	108	57	21,088
35—39	...	27	356	1,784	6,255	4,010	1,734	632	261	127	15,186
40—44	...	6	39	186	733	2,748	1,605	746	236	110	6,409
45—49	...	2	1	10	29	121	339	178	83	26	789
50—54	...	...	1	1	3	1	4	11	9	2	32
55—59	...	...	...	...	2	1	...	...	2	3	8
Totals	329	9,696	20,542	19,949	16,438	10,727	4,994	2,170	760	359	85,964

CHAPTER III

COMPARATIVE FERTILITY

Comparative fertility of each sex at different ages.—In order to obtain the comparative fertility of each sex at different ages, it is necessary to know (1) the number living at the middle of 1855, at each group of ages, and (2) the legitimate children born in the year 1855, of parents at those ages. The calculation is bigenous, and we take first the whole female population, whether married or not.

Female fertility.—The comparative fertility is shown in Table XI. The female population is grouped in quinquennial groups of ages covering the years of child-bearing. The number of women of these ages in the population of Scotland in the middle of the year 1855 is calculated from the census returns of 1851 and 1861. The legitimate children born in the year of wives at quinquennial groups of ages during the child-bearing period of life, have been ascertained, as shown in Table X. (p. 21). We then compare these data with each other, and column (*d*) shows the proportion of women living to each child, while column (*e*) shows the number of children to every

hundred women. Discussing the facts shown by the table, it appears that one child is born for every 10.5 women in the population at child-bearing ages, and that 9.5 children are born annually for every hundred women. The fertility varies considerably at different groups of ages, the highest comparative fertility being

TABLE XI.—*Showing the Comparative Fertility of the Female Population of Scotland in* 1855. *Legitimate Births only.*

Ages. (*a*)	Number of Women, estimated to Middle of 1855. (*b*)	Legitimate Children Born. (*c*)	Number of Women to each Child. (*d*)	Number of Children to 100 Women. (*e*)	Duncan's Figures, Comparative to Column (*e*). (*f*)
15—19	155,258	1,672	92.86	1.08	1.20
20—24	152,240	16,357	9.31	10.74	10.77
25—29	128,200	24,423	5.25	19.05	17.11
30—34	107,713	21,088	5.11	19.58	16.04
35—39	91,768	15,186	6.04	16.55	12.57
40—44	85,180	6,409	13.29	7.52	4.73
45—49	68,595	789	86.94	1.15	·69
50—54	66,243	32	2070.00	.05	...
55—59	47,173	8	5896.60	.02	...
Total .	902,370	85,964	10.50	9.52	...

shown by women aged 30-34, there being 5 women at these ages for each child born, or nearly 20 children for every hundred women.

The quinquennium 25-29 approaches very closely in fertility to that of 30-34, and the next most fertile portion of the female population is aged 35-39.

Comparing this table with that of Duncan, for Edinburgh and Glasgow, it will be seen that in the former the highest fertility is found to be in the

quinquennium 30-34, whereas in the latter it is in the quinquennium 25-29. The figures for the early quinquennia 15-19 and 20-24 are much the same, but those for the later ages show that fertility is really greater at these later ages than would appear from the figures for the two cities. The explanation of these discrepancies is again the same as formerly alluded to, and consists in the age constitution of town populations as compared with that of the whole country.

Conclusions as to the comparative fertility of the whole female population.—(1) That it increases gradually from the commencement of the child-bearing period of life, and that it declines after the age of 34 is reached. (2) That it is greatest in the decade of years 25-34. (3) That it is greater in the decade 30-39 than in the decade 20-29. These conclusions agree with those at which Matthews Duncan arrived; but the decline in fertility is shown to begin at a later period of life than that fixed by him.

In order to eliminate any error which the limitations of Table XI. may have imposed, we have prepared Table XII., in which the comparative fertility of the whole female population is more completely shown, by including the illegitimate births. The figures are still probably under the mark, owing to the exclusion of stillbirths, but they more nearly express the fertility of the whole population.

Table XII. is the same as Table XI., but includes the illegitimate births. It will be seen that their

effect is mainly to raise the fertility of the lower ages, viz., 15-19 and 20-24. At higher ages than these the increase is relatively less.

TABLE XII.—*The same as the previous Table, but including Illegitimate Births.*

Ages.	Number of Women, estimated to Middle of 1855.	Number of Children Born.	Number of Women to each Child.	Number of Children to 100 Women.
14	...	2	...	...
15—19	155,258	2,647	58.65	1.70
20—24	152,240	19,623	7.76	12.89
25—29	128,200	26,321	4.87	20.53
30—34	107,713	21,869	4.93	20.30
35—39	91,768	15,553	5.90	16.95
40—44	85,180	6,513	13.08	7.64
45—49	68,595	801	85.64	1.17
50—54	66,243	32	2070.00	.05
55—59	47,173	8	5896.60	.02
Total .	902,370	93,369	9.66	10.35

Male fertility.—Our cards enable us to submit in Table XIII. a statement as to the comparative fertility of the whole male population. It includes only legitimate births, since the registers do not contain information as to the ages of the fathers of illegitimate children. The male population is estimated to the middle of 1855, from the census figures of 1851 and 1861. The legitimate children born in the year to fathers at quinquennial groups of ages are known from Table VIII. (p. 18). The number of men to every child born and the number of children to every hundred men are stated respectively in the next

columns of Table XIII. The conclusions to which this table leads are, (1) that the highest fertility is found in the male population in those aged 30-34 (the same quinquennium as in the case of the females); (2) the next highest fertility is found in the quinquennium 35-39, and not, as in the case of the

TABLE XIII.—*Showing Fertility of the Male Population of Scotland. Legitimate Births only.*

Ages.	Male Population at Middle of 1855.	Legitimate Children Born in 1855.	Number of Men to each Child.	Number of Children to 100 Men.
15—19	147,781	329	449.20	.22
20—24	128,128	9,696	13.21	7.57
25—29	102,998	20,542	5.01	19.94
30—34	89,437	19,949	4.48	22.30
35—39	76,963	16,438	4.68	21.36
40—44	72,124	10,727	6.72	14.87
45—49	58,960	4,994	11.81	8.47
50—54	54,758	2,170	25.23	3.96
55—59	39,109	760	51.46	1.94
60—64	36,254	244	148.58	.67
65—69	23,075	77	299.67	.33
70—74	17,658	29	608.89	.16
75—79	10,232	5	2046.40	.05
80 and over	8,312	4	2078.00	.05
Total .	865,789	85,964	10.07	9.93

females, in the lower ages 25-29. This might perhaps be expected, in view of the fact that male procreative ability does not diminish so early in life as the reproductive functions of the female. Whereas female fertility is insignificant after the age of 49, the male fertility only declines gradually during the ten years succeeding that age. The fertility of the whole male population at procreative ages is much the same

as that of the whole female population at child-bearing ages. There are 9.93 children to every hundred men and 9.52 to every hundred women. One woman in every 10.50 and one man in every 10.07 annually has a legitimate child.

CHAPTER IV

COMPARATIVE FECUNDITY. DECLINE OF THE BIRTHRATE

Comparative fecundity of the whole married population of Scotland in 1855.—This subject must be considered first in relation to the one sex and then in relation to the other, and finally in relation to the sexes united as married couples. Fecundity is the quality of ascertained productiveness; it has nothing to do with the numbers of children, only with the fact of children or no children. It is, in short, a record of birth transactions, and not of the magnitude of such transactions. Fecundity can only be calculated in relation to those whose faculty of productiveness is tested; it can therefore be calculated only on the wives and husbands separately or combined as married couples, and not on the whole male or female population.

Fecundity of wives as a whole.—In order to ascertain the fecundity of wives, it is necessary to know (1) the number of wives in the population; (2) the number of wives-mothers in the population, *i.e.*, wives having a birth in the year. From these it is possible to calculate the proportion of wives-mothers

to wives, and the number out of 100 wives who will become wives-mothers annually. Table XIV. shows the comparative fecundity of wives at different ages in Scotland in 1855. As in other tables, the ages selected are the quinquennial periods 15-19, up to 55-59. The number of wives in the population is

TABLE XIV.—*Showing the Comparative Fecundity, at Quinquennial Groups of Ages, of the Wives in Scotland in* 1855.

Ages.	Wives, estimated to Middle of 1855.	Wives-Mothers in 1855.	Number of Wives to each Wife-Mother.	Number of Wives-Mothers to 100 Wives.	Compare Matthews Duncan's Percentages, Edinburgh and Glasgow.
15—19	3,261	1,667	1.95	51.12	50.00
20—24	38,078	16,256	2.34	42.70	41.79
25—29	66,066	24,170	2.73	36.60	34.64
30—34	68,786	20,802	3.31	30.24	26.56
35—39	61,712	14,936	4.13	24.20	20.39
40—44	55,784	6,318	8.83	11.33	8.04
45—49	43,302	784	55.23	1.81	1.27
50—54	37,457	32	1170.53	.09	...
55—59	23,861	6	3976.83	.03	...
Total .	398,307	84,971	4.68	21.33	...

estimated to the middle of 1855 from the census figures of 1851 and 1861. The total number of wives at possible child-bearing ages is 398,307. The number of wives who proved fruitful during 1855 is shown in column 2 of the table. The figures are the actual numbers during the year 1855, as ascertained by us. Compare Table III. (p. 13). The total number of wives-mothers is 84,971. Table XIV. shows that of the whole wives at possible child-

bearing ages, 1 in 4.68, or 1 in 5, is annually fruitful, and that of every 100 wives, 21 annually increase the population. Comparing now the different groups of ages, it is apparent that the comparative fecundity undergoes a regular decline as age advances. The fecundity of the mass of wives is greatest in the early years of the child-bearing period. Wives aged 15-19 are most fecund; over 51 per cent. of them prove fecund in any year. The next quinquennial period, 20-24, shows a fecundity of 43 per cent.; a decline of 8 per cent. Each succeeding quinquennial period of age is less fecund than its predecessor by about 6 per cent. This holds until the age of 40 is reached; the fecundity for the quinquennium, 40-44, is, however, 13 per cent. less than in the preceding 5 years. A further great decline of nearly 10 per cent. marks the next quinquennium, and the fecundity of wives above 50 is insignificant. These results agree in general with those conclusions at which Matthews Duncan arrived from a study of the statistics of Edinburgh and Glasgow, but it is noteworthy that the actual fecundity of wives at each group of ages in the whole country exceeds the figures which he gives as applicable to the cities. There is not much difference, except at the ages above 30 and up to 45; but for these years the fecundity is higher by as much as from 3 to 4 per cent. The fecundity of wives aged 15-29 is fully double that of wives aged 30-49, as stated by Duncan. There were 107,405 wives under 30, and 42,093 of them bore children; while there were 229,584 wives aged 30-49, and 42,840 of them

bore children. These figures give a fecundity per 100 wives of 39.19 in the one case, and of 18.66 in the other. His further comparison of wives 15-29 inclusive with wives 30-44 inclusive, is not confirmed by further investigation. It will be seen that of 107,405 wives aged 15-29 inclusive, 42,093 bore children, and of 186,282 wives aged 30-44 inclusive, 42,056 bore children. This gives a fecundity per 100 wives of 39.19 in the younger wives compared with that of 22.57 in the later period of 15 years. If the elder wives had been as fecund as the younger group they would have produced 73,005 children, or $1\frac{3}{4}$ times as many as they actually did produce.

With regard to the fecundity at individual ages instead of in groups of ages, the information at our disposal would enable us to state figures for each year of age, but it has not been thought worth while to divide up the quinquennial groups of wives in the population. Duncan gives a table for individual ages from 16-20, and points out that wives of 17, 18, and 19 have a fecundity of 50-51 per cent. This so closely tallies with the fecundity of 51 per cent. shown by the Table XIV. to appertain to wives of the age group 15-19, that it does not appear necessary to prepare figures for each individual age.

Conclusions as to the fecundity of wives.—(1) That the fecundity of the wives in the population is greatest in the early years of the child-bearing period of life. (2) That in each succeeding quinquennium of age the fecundity diminishes, more or less regularly at first, but towards the end of the child-bearing period

of life the decline is rapid. (3) That the fecundity of wives aged 15-29 is about $1\frac{3}{4}$ times as great as that of wives aged 30-44. (4) That after the age of 40 is reached there is a pronounced fall in fecundity, a fall repeated at the age of 45. In subsequent years the fecundity is insignificant. (5) That of all wives living in Scotland at the ages of 15-44 one in 3.5, or 28.6 per cent., bore a living child; whilst in the first half of this period, viz., 15-29, one wife in 2.5, or roughly 40 per cent., bore a living child; and in the second half of this period, viz., 30-44, one wife in 4.4, or roughly 22 per cent., bore a living child. Conclusive as these results are in regard to the aggregate population of wives, they do not necessarily hold good in regard to each individual wife. The youngest wives are comparatively most fecund, but an individual wife may not attain her highest fecundity until a later age. So many young wives are intensely fertile as to make up in the mass for the sterility of immaturity which affects some of them individually.

Fecundity of husbands as a whole.—The comparative fecundity of the mass of husbands at different ages is shown in Table XV. Column 1 shows the number of husbands, estimated to the middle of 1855, and arranged in quinquennial groups according to their ages. Column 2 shows the ascertained number of husbands-fathers in 1855. The figures are from Table VII. (p. 18), to which the reader is referred. Column 3 shows the number of husbands to each husband-father. Column 4 shows the number of husbands-fathers to each 100 husbands. The total

number of husbands is 425,747, and the total number of husbands-fathers is 84,971. Table XV. shows that there are 5.01 husbands for each husband-father, and that out of each 100 husbands 19.96 annually become fathers of living children. The comparative

TABLE XV.—*Showing the Comparative Fecundity, at Quinquennial Groups of Ages, of the Husbands in Scotland in* 1855.

Ages.	Husbands, estimated to Middle of 1855.	Husbands-Fathers in 1855.	Number of Husbands to each Husband-Father.	Number of Husbands-Fathers to 100 Husbands.
15—19	563	328	1.72	58.26
20—24	21,034	9,628	2.18	45.78
25—29	50,655	20,352	2.48	40.18
30—34	60,230	19,730	3.05	32.76
35—39	57,958	16,204	3.58	27.95
40—44	56,044	10,554	5.31	18.83
45—49	46,397	4,935	9.40	10.63
50—54	42,297	2,146	19.71	5.07
55—59	29,660	745	39.81	2.51
60—64	25,893	236	109.72	.91
65—69	15,510	76	204.08	.49
70—74	10,629	29	366.51	.27
75—79	5,417	5	1083.40	.09
80 and over	3,460	3	1153.30	.08
Total .	425,747	84,971	5.01	19.96

fecundity of husbands of different ages is shown by the table, and as in the case of wives, the highest fecundity is attained at the lowest group of ages. Husbands of 15-19 have a fecundity of 58 per cent., and this decreases as age advances; the fecundity is, however, at each group of ages higher than the fecundity of wives at similar ages. Compare Table XV. with Table XIV. The fecundity of husbands

of 65 and upwards being very small, we are enabled to compare two periods of 25 years each, prior to this age. Husbands aged 15-39 numbered 190,440, and of these 66,242 begot a living child; that is, one in 2.9 husbands of these ages had a legitimate child. Husbands aged 40-64 numbered 200,291, and of these only 18,616 begot a living child; that is, only one in 10.8 of these husbands had a legitimate child.

Husbands under 40 are more than $3\frac{1}{2}$ times as fecund as those over 40 but under 65. In allowing to this result its full value, one must take into account the dependence of male fecundity upon conjunction with a female of child-bearing age. Husbands above 40 might prove as a whole more fecund if united to wives of lower ages. The fall in male fecundity after 40 may be due in part to the frequent impossibility of proving fecund, owing to the advancing age of the wife and not to any diminution of power of begetting living children.

The comparative fecundity of husbands maintains quite a considerable figure some 10-15 years later than that of wives. There is not in it a sudden drop, as is noticed in the case of wives over 44. The decline of fecundity is spread over a larger number of years of age, and fecundity does not become insignificant until the age of 59 is passed.

Conclusions as to the fecundity of husbands.—The conclusions as to the comparative fecundity of husbands may be stated thus—(1) That the fecundity of the mass of husbands in the population is greatest during the earliest years of procreative ability, and

after that period gradually declines, although it persists in some small degree even in late life. (2) The fecundity of husbands as a whole is small after the age of 64, and is much higher at ages under 40 than between 40 and 64. (3) The fecundity of husbands at ages between 40 and 64 is probably in reality higher than the figures show, or rather the fact may be better stated thus,—there is some probability that husbands of 40-64 might prove more fecund than in actual experience they do, if they had better opportunities of proving their fecundity. (4) A definite correlation can be detected between male and female fecundity. On conjunction of Tables XIV. and XV., it is seen that male fecundity reaches at a later period of age the same height as female fecundity. This delay is apparently about 2 or 3 years, and is probably explained by a customary seniority in age on the part of the husbands in the marriages of this country. There is no evidence that this divergence in fecundity of the two sexes is dependent upon any physiological law. A similar observation has been made by Körösi, who found that in Norway the epoch of difference in fecundity was about 2.5 years, while in Buda-Pesth it amounted even to 5 years.

Fecundity of married couples.—Having considered the fecundity of the sexes separately, it is now necessary to consider the comparative fecundity of married couples in their various combinations of ages. For this purpose Tables XVI. and XVII. have been prepared. The investigation deals with the whole

TABLE XVI.—*Fecundity of Married Couples, in Combinations of Ages.*

Wives' Ages.		Husbands' Ages.									
		15—19.	20—24.	25—29.	30—34.	35—39.	40—44.	45—49.	50—54.	55—59.	60 and over.
15—19	Married Couples existing, 1855 . .	248	1,937	782	194	61	18	10	9	1	1
	Number of Couples having a Birth .	167	1,012	373	77	24	8	5	0	1	0
20—24	Married Couples existing, 1855 . .	188	14,084	15,871	5,383	1,529	634	213	103	36	37
	Number of Couples having a Birth .	136	6,447	6,630	2,012	705	226	58	28	10	4
25—29	Married Couples existing, 1855 . .	21	4,477	27,573	21,131	8,118	2,843	1,109	449	205	140
	Number of Couples having a Birth .	21	1,892	10,591	7,148	2,946	967	369	158	48	30
30—34	Married Couples existing, 1855 . .	7	668	6,928	27,374	19,260	8,895	3,203	1,525	486	440
	Number of Couples having a Birth .	4	242	2,365	8,539	5,621	2,595	866	410	105	55
35—39	Married Couples existing, 1855 . .	2	112	1,170	6,747	23,482	17,488	7,566	3,065	1,225	855
	Number of Couples having a Birth .	...	27	352	1,761	6,149	3,940	1,704	625	255	123
40—44	Married Couples existing, 1855 . .	...	32	236	1,487	6,032	21,010	14,301	7,804	2,651	2,231
	Number of Couples having a Birth .	...	6	39	183	727	2,695	1,592	736	233	107
45—49	Married Couples existing, 1855 . .	...	8	52	305	1,258	5,203	15,801	11,881	5,079	3,715
	Number of Couples having a Birth .	...	2	1	9	28	121	337	178	82	26

TABLE XVII.—*Fecundity of Married Couples, in Combinations of Ages.*

Wives' Ages.		Husbands' Ages.									
		15—19.	20—24.	25—29.	30—34.	35—39.	40—44.	45—49.	50—54.	55—59.	60 and over.
15—19	Number of Married Couples to each Birth	1.49	1.91	2.09	2.52	2.54	2.25	2.00	...	...	...
	Births to 100 Couples.	67.34	52.24	47.70	39.69	39.34	44.45	50.00	...	...	...
20—24	Number of Married Couples to each Birth	1.38	2.18	2.39	2.67	2.16	2.80	3.67	3.67	3.60	9.25
	Births to 100 Couples.	72.33	45.78	41.77	37.38	46.11	35.65	27.23	27.18	27.78	10.81
25—29	Number of Married Couples to each Birth	1.00	2.36	2.60	2.95	2.75	2.94	3.00	2.84	4.27	4.66
	Births to 100 Couples.	100.00	42.26	38.41	33.83	36.29	34.01	33.27	35.19	23.42	21.43
30—34	Number of Married Couples to each Birth	1.75	2.76	2.92	3.20	3.42	3.42	3.69	3.72	4.62	8.00
	Births to 100 Couples.	57.14	36.23	34.14	31.20	29.19	29.17	27.04	26.89	21.61	12.50
35—39	Number of Married Couples to each Birth	...	4.15	3.32	3.83	3.81	4.43	4.44	4.90	4.80	6.95
	Births to 100 Couples.	...	24.11	30.09	26.10	26.19	22.53	22.52	20.39	20.82	14.39
40—44	Number of Married Couples to each Birth	...	5.33	6.05	8.12	8.29	7.79	8.98	10.60	11.37	20.85
	Births to 100 Couples.	...	18.75	16.53	12.31	12.05	12.83	11.13	9.43	8.79	4.80
45—49	Number of Married Couples to each Birth	...	4.00	52.00	33.88	44.84	42.92	46.95	66.74	61.93	142.88
	Births to 100 Couples.	...	25.00	1.92	2.95	2.23	2.33	2.13	1.49	1.61	0.70

married couples of Scotland ; but instead of calculating the fecundity of each possible combination of ages of the parents, it has been found advisable to maintain the quinquennial groupings of ages, and to calculate the fecundity for each possible combination of quinquennia. Though it would have been interesting to have submitted figures for each possible combination of years of age of the parents, it is not possible to do so, because the census returns from which the population of married couples is calculated are given only in quinquennial groups. Our cards disclose the number of parents at each combination of ages, and we have grouped these quinquennially for comparison with the census returns. Undoubtedly this method has the advantage that it provides larger numbers for expressive use. It avoids errors due to paucity of data, which might invalidate our figures for combinations of individual ages.

Table XVI. shows for each quinquennial combination of ages of husbands and wives, (1) the number of married couples existing in 1855 ; (2) the number of such couples having a birth in 1855. From these figures we derive the fecundity, as shown in Table XVII. It will be observed that the estimated number of married couples in the population does not correspond with the number of husbands, as shown in Table XV. The reason of this is that in the census returns for 1851 and 1861 there were noted large numbers of (1) wives whose husbands were absent ; (2) husbands whose wives were absent. These numbers of course did not correspond, and yet could not both

be included in the married couples table, because in that case many couples would be included twice. On consideration, therefore, we decided that the proper course was to include the "wives whose husbands were absent." As the ages of their husbands were not stated, we distributed these wives in the groups in the same proportion as those whose husbands were present. The husbands whose wives were absent we disregarded. Thus the number of married couples will not correspond with the number of married men, but will correspond with the number of married women. It is evident that it cannot correspond with both, seeing that the numbers are not equal. As the wife is the main centre of biogenic statistics, it seems better to let the wives and married couples correspond. Table XVII. gives for each quinquennial combination of ages of husbands and wives, (1) the number of married couples among whom one birth will occur annually; (2) the percentage of annual births to married couples existing.

We may now proceed to analyse the results set forth in these two tables. The total married couples of Scotland in 1855 numbered 438,024, and of these 84,971 added one or more live children to the population in that year. This means that one in every 5.15 couples produce a living child yearly, or that 19.4 out of every 100 couples have a satisfactory birth transaction within the year. The fecundity of wives with husbands of all ages has been already shown in Table XIV. That of wives with husbands of definite quinquennial ages may be ascertained in this Table XVII.

Wives aged 15-19 show their highest fecundity with husbands also aged 15-19, and their fecundity remains high but diminishes gradually as the age of the husband increases up to 40 years. With husbands above 40 years the table shows an apparent rise in fecundity, but this is not reliable, owing to the smallness of the available figures. These latter figures are merely inserted for what they are worth, and no stress is laid upon them; nor can they be interpreted, without further support, as proof of any such rise in fecundity.

Wives aged 20-24.—These wives likewise show their highest fecundity with husbands of 15-19, and their fecundity is high with husbands of any age up to 59. It diminishes gradually as the age of the husband increases to 59, but there is an interpolated rise of fecundity with husbands aged 35-39. We are unable to submit any adequate explanation of this irregularity. With husbands of 60 and upwards the fecundity of these wives is still appreciably good, though the figures for the ages above 55 are rather small for unimpeachable results.

Wives aged 25-29.—These wives show universal fecundity with husbands of 15-19; their fecundity with husbands of greater age is always high, declining only from 42 to 35 as the husbands' ages rise from 20 to 54. The decline is not regular, as the table shows that such wives are more fecund with husbands aged 35-39 than with those whose ages fall in the next quinquennia, viz., 30-34 and 40-44. One does not attach much importance to this variation in

fecundity. The important point is the maintenance of a high standard of fecundity with husbands of any age. Even with husbands of 55 and upwards the fecundity does not fall below 21 per cent. It is sustained even with husbands more than 30 years older than the wives.

Wives aged 30-34.—These wives exhibit also a high level of fecundity, but at each individual quinquennium of age of the husbands the fecundity of such wives is lower than that of wives aged 25-29. The fecundity of wives aged 30-34 with husbands of 15-19 is higher than their fecundity with older husbands, but the number of couples dealt with is small, and the actual figures of 57 per cent. therefore unreliable. At later ages of the husbands, however, the figures are amply large, and probably worthy of credence. It will be seen on referring to the table that the fecundity of wives aged 30-34 progressively decreases as the age of the husband advances. The decline is fairly regular from a fecundity of 36 per cent. to that of 21 per cent. at the husband's age of 59. When the husband is 60 and over, the fecundity undergoes a sudden drop of nearly one-half, from 21.6 to 12.5. On the whole, however, wives aged 30-34 show a high fecundity, sustained even with husbands of much higher ages. It may be interesting to mention here an instance which will be disclosed again in dealing with plural births, of fecundity of a wife of 30 with a husband of 86. The couple had twins in 1855, if the registers are correct, and there is no evidence to the contrary; indeed special search

was made before accepting the original entry as correct.

Wives aged 35-39.—These wives show a moderate fecundity ranging from 14 to 30 per cent. They attain their highest fecundity with husbands aged 25-29, and at later ages the fecundity declines very gradually: it is still as high as 20 per cent. with husbands aged 55-59. With husbands over 60 it drops to 14 per cent. The table shows that with husbands of 20-24 the fecundity of these wives is less than with husbands of between 25-40.

Wives aged 40-44.—As the age of the wife exceeds 40 a region of low fecundity is reached. Such wives best show their fecundity with husbands of 20-24, but the numbers available are small, both as regards this quinquennium and the next. The feature of the fecundity of wives of this age is the uniformity of results with husbands between 30-50. Their fecundity is steady at 12 per cent. If the husband is over 50 the fecundity is less, and very low if he be over 60. In judging of this fact, one must bear in mind that the table deals with all births and not only with first births, and that therefore wives who have reached the age of 40-44, and whose husbands are older than themselves, may have largely exhausted their reproductive powers by previous births. We shall be able in a later chapter to judge of the fecundity of wives who are married at this advanced age, and to compare it with the fecundity here given of all wives of these ages, many of whom have passed through twenty years of married life.

Wives aged 45-49.—After wives have passed 45 years their fecundity is very low, and shows little alteration according to the age of the husband. Their fecundity is about 3 per cent. with husbands aged 30-34, and from 1.5 to 2.5 per cent. with all other husbands under 60. This table shows a high fecundity with husbands of 20-24, but it is open to doubt, by reason of the paucity of data. With husbands of 60 and upwards the fecundity is almost nil.

Comparison of female fecundity in various countries.—Though there are no contemporary figures with which to compare the results obtained by Matthews Duncan and by ourselves, nevertheless during the last half-century several similar investigations have been published. These we have collected and arranged in Table XVIII., for comparative purposes. A general survey of the table shows that in each case, notwithstanding that the countries and towns represent both European and Australasian experience, the fecundity of the married women early reaches its highest point. In most cases the maximum fecundity is attained at ages 15-19, though in a few instances it is not reached until the ages 20-24. From the maximal point the fecundity shows a regular decline with advancing age, and is very small after the age of 45 years. The general agreement between figures drawn from so many sources and bearing dates so widely separate, provides a *prima facie* argument for their broad accuracy.

The fecundity of husbands.—This has been shown

TABLE XVIII.—*Comparative Table of Female Fecundity for Quinquennial Groups of Ages.*

Age of the Mother.	Scotland. — *Lewis.*	Edinburgh and Glasgow. *Duncan.*	Alsace-Lorraine. — *Körösi.*	Norway. — *Kiaer.*	Finland. — *Körösi.*	Brunswick. — *Körösi.*	Denmark. — *Official.*	Berlin. — *Boeckh.*	Buda-Pesth. — *Körösi.*	Sweden. — *Sidenbladh.*	France. — *Turquan.*	New South Wales. — *Royal Commission.*			
	1855.	1855.	1872.	1874-76.	1880-81.	1880-81.	1880-89.	1887-90.	1889-92.	1891.	1892.	1871.	1881.	1891.	1901.
15—19	51.12	50.00	46.50	41.30	37.95	58.10	71.50?	50.34	42.80	51.81	40.00	50.1	51.6	47.91	56.28
20—24	42.70	41.79	56.30	51.90	40.59	45.40	49.37	45.55	35.80	45.14	28.60	44.15	45.79	41.63	39.70
25—29	36.60	34.64	46.30	43.00	35.69	34.70	40.50	33.60	29.20	37.53	25.00	40.75	40.52	35.37	29.87
30—34	30.24	26.56	38.80	36.00	32.15	26.80	31.15	22.50	20.60	31.18	17.70	33.67	33.86	29.22	22.68
35—39	24.20	20.39	28.20	30.00	26.12	19.80	22.98	14.50	14.70	25.04	11.20	27.04	27.36	23.63	17.25
40—44	11.33	8.04	...	18.10	15.75	8.10	11.39	6.03	5.90	14.23	4.90	13.41	12.89	11.84	8.81
45—49	1.81	1.27	...	3.30	2.68	1.10	1.30	0.74	0.70	2.00	0.70	0.71	0.78	0.55	0.43

in regard to husbands as a whole, in Table XV. (p. 33), which has reference to fecundity with wives of all ages. Now we are able to consider the fecundity of husbands with wives of different ages, as shown in Table XVII. (p. 37).

Husbands aged 15-19 show high fecundity with wives up to 34. Their fecundity is always above 50 per cent., and rises as the age of the wife rises from 15-29 years. With wives of 30 to 34, fecundity, though still high, is lower than in the earlier quinquennia, but the numbers are too small to justify any conclusion. In the registers of the particular year 1855, the fecundity of husbands aged 15-19 with wives aged 25-29 was 100 per cent. This must be regarded as an accidental consequence of the fact that the population of married couples of these ages has of necessity been estimated, and not enumerated in the same way as the actual births. Moreover, the numbers dealt with are somewhat small. Nevertheless, it serves to emphasise the high fecundity of this combination of ages, and the true figure may be reasonably supposed not to fall far short of, if indeed it be not greater than, the fecundity of these husbands with wives of 20-24.

Husbands aged 20-24.—At this age husbands show what one may regard as typical fecundity. It appears that fecundity of couples gradually declines as the age of the wife advances. Husbands aged 20-24 have their highest fecundity with wives of 15-19; the figure then being over 50 per cent. The fall is steady but gradual to a fecundity of 18 per cent. with wives of 40-44. True, the table shows a somewhat doubtful

rise in fecundity with wives of 45-49, but this may not be actually the case, since the figures provided at these ages are very small. The important point is to notice that the fecundity is above 40 per cent. with wives aged 20-24 and 25-29, the former group specially representing large numbers of the married couples in the land.

Husbands aged 25-29.—These husbands exhibit a high fecundity with young wives and a low fecundity with old wives. Beginning at the earliest quinquennium with a fecundity of 47 per cent., we find that at the latest quinquennium barely 2 per cent. exhibit fecundity. The fecundity does not fall below 30 per cent. until the wife's age exceeds 39 years. Then there is a sudden decline with wives aged 40-44, accentuated still further with wives aged 45-49. On the whole, such husbands are highly fecund with most wives, though they show the normal law, viz., fecundity in inverse ratio to the age of the wife.

Husbands aged 30-34.—The fecundity of these husbands begins with the youngest wives at 39 per cent., and gradually falls to 3 per cent. with wives aged 45-49. Observe, first, that the fecundity is less than that of husbands aged 25-29 at each quinquennial age of the wives, with the exception of the last group, in which the wives are 45-49.

Husbands aged 35-39.—In this column it will be seen that the fecundity does not, as in the two former quinquennia, regularly decline with the age of the wife. It attains its highest point of 46 per cent. with wives of 20-24, and thereafter declines as the age of the wife

increases. With wives above 34, these husbands exhibit a fecundity almost identical with that of husbands aged 30-34.

Husbands aged 40-44.—Here again we have progressive declinature of fecundity according to the age of the wife. On the whole, the fecundity is less than that of the younger husbands, though with the youngest wives a fecundity of 44 per cent. is reached. With wives above 40, the fecundity is much the same as that of husbands in the two previous quinquennia; but with wives between 20 and 30, the fecundity, though high, is less than that of husbands five years younger.

Husbands aged 45-49.—The figures appertaining to this group are somewhat irregular. An apparent fecundity of 50 per cent. with wives aged 15-19 may be due to paucity of data, and otherwise in only one group does the fecundity exceed 39 per cent. This occurs with wives aged 25-29, and after that age is passed fecundity declines as the age of the wife rises. The fecundity of these husbands with wives aged 20-24 is only 27; that is less than with wives aged 25-29. It appears as if a difference of 5 years between husband and wife was less favourable to fecundity than a difference of 20 years.

Husbands aged 50-54.—Only with wives of 25-29 does the fecundity of these husbands reach over 30 per cent. Their fecundity with wives aged 20-24 is less than with wives of 25-29. This corresponds to the experience of husbands in the previous quinquennium. With wives above 29 the fecundity decreases as the age of

the wife rises, and at each quinquennium of age of the wife the fecundity is less than that of husbands of 45-49. Most of the couples in which the husbands are 50-54 are made up of wives 45-49, so that the general fecundity of the quinquennium is low.

Husbands aged 55-59.—The fecundity of this group of husbands follows the regular course of decline according to the advancing age of the wife. At no age of the wives does it reach 30 per cent., but decreases steadily from a maximum of 27 per cent. with wives aged 20-24 to a minimum of 1.6 per cent. with wives aged 45-49.

Husbands aged 60 *and upwards.*—As might be expected from the variation in age of the husbands included in this group, the fecundity figures are somewhat irregular. Most of the fruitful couples are those with wives from 35-44, and the fecundity is low. The largest number of married couples with husbands over 60 contain wives over 45, and these take little part in recruiting the population. With wives aged 25-29 these husbands may have a fecundity of over 20 per cent., but at all the other ages it is less.

Comparison of male fecundity in various countries.—Owing to the minor significance of male fecundity, figures relating thereto have been collected in but few countries. In Table XIX. will be found the male fecundity figures of four localities available for comparison. Dr Matthews Duncan did not investigate the fecundity of the husbands of Edinburgh and Glasgow. The table exhibits for these four series of observations features very similar to those shown in

the case of the wives in Table XVIII. The maximum fecundity is found at or near the earliest ages, and there is observed also a steady decline as the age increases. Fecundity becomes small after the age of fifty, but does not wholly disappear even at very advanced ages.

TABLE XIX.—*Comparative Table of Male Fecundity at Quinquennial Groups of Ages.*

Age of the Father.	Scotland. *Lewis.* 1855.	Alsace-Lorraine. *Körösi.* 1872-73.	Norway. *Kiaer.* 1874-76.	Buda-Pesth. *Körösi.* 1889-92.
15—19	58.26	21.20	27.00	...
20—24	45.78	61.70	49.80	33.30
25—29	40.18	53.30	43.60	35.80
30—34	32.76	44.20	37.70	27.10
35—39	27.95	32.50	30.30	21.10
40—44	18.83	20.90	22.50	13.80
45—49	10.63	10.90	12.80	7.20
50—54	5.07	...	6.30	3.50
55—59	2.51	...	2.60	1.70
60—64	0.91	...	1.33	0.70
65—69	0.49	...	0.66	0.40
70—74	0.27	...	0.32	0.20
75—79	0.09	...	...	...
80 and over	0.08	...	...	...

Fecundity of married couples. — The fecundity of married couples depends upon two factors—(*a*) the age of the wife, and (*b*) the age of the husband. Of these two factors the former is infinitely the more important. To facilitate the study of this fecundity, Table XX. has been constructed, and in it the figures already set forth in Table XVII. have been rearranged and marshalled according to the difference in age between the husband and the wife. The ages are stated in quinquennia, so that when a husband and wife are said to be

TABLE XX.—*Fecundity of Married Couples.*

Wives' Ages.	Husbands									
	30 Years Older.	25 Years Older.	20 Years Older.	15 Years Older.	10 Years Older.	5 Years Older.	Equal in Age.	5 Years Younger.	10 Years Younger.	15 Years Younger.
15—19	50.00	44.45	39.34	39.69	47.70	52.24	67.34	...	...	...
20—24	27.18	27.23	35.65	46.11	37.38	41.77	45.78	72.33	...	...
25—29	23.42	35.19	33.27	34.01	36.29	33.83	38.41	42.26	100.00	...
30—34	12.50	21.61	26.89	27.04	29.17	29.19	31.20	34.14	36.23	57.14
35—39	...	14.39	20.82	20.39	22.52	22.53	26.19	26.10	30.09	24.11
40—44	...	...	4.80	8.79	9.43	11.13	12.83	12.05	12.31	16.53
45—49	...	...	...	0.70	1.61	1.49	2.13	2.33	2.23	2.95

equal in age, it means that their ages fall in the same quinquennium, and not that their individual ages are identical. The table shows that the fecundity of a husband and wife in the same age-group declines steadily with advancing years from a fecundity of 67 in the first quinquennium to 2 in the age-group of 45-49 years. With some slight irregularities, which may possibly be due to erratic statements of age on the part of the wives, the columns of the table show that the fecundity of married couples decreases as the age of the wife increases, whatever the relative age of the husband may be. Similarly, reading the table across, there is revealed a tendency for fecundity to rise as the seniority of the husband is diminished and finally yields place to seniority on the part of the wife.

Comparison of the fecundity of married couples in this and other countries.—The Scottish figures for 1855 on this point are comparable only with the Norwegian and Buda-Pesth results as given by Körösi. In Table XXI. we have therefore placed these in parallel columns. True, the fecundity of married couples in New South Wales has been fully stated by Mr Coghlan, but his figures refer to individual and not to quinquennial ages. It will be noticed that the Scottish figures occupy throughout the table an intermediate position between those of Norway and Buda-Pesth. It would have been interesting to show isogenic curves for the specified ages of the married couples of 1855 for comparison with those of Buda-Pesth. The census returns, however, give the ages of the married population only in quinquennia.

TABLE XXI.—*Comparative Table of Fecundity of Married Couples. Ages stated in Quinquennia.*

Age of the Father.	Age of the Mother.																				
	Under 20.			20—24.			25—29.			30—34.			35—39.			40—44.			45—49.		
	Norway.	Buda-Pesth.	Scotland.	Norway.	Buda-Pesth.	Scotland.	Norway.	Buda-Pesth.	Scotland.	Norway.	Buda-Pesth.	Scotland.	Norway.	Buda-Pesth.	Scotland.	Norway.	Buda-Pesth.	Scotland.	Norway.	Buda-Pesth.	Scotland.
20—24	...	48.0	52.24	53.4	35.0	45.78	48.9	27.3	42.26	...	22.8	36.23	...	...	24.11	...	...	18.75	...	...	...
25—29	...	44.2	47.7	50.3	40.7	41.77	45.1	33.9	38.41	40.1	25.8	34.14	...	22.1	30.09	...	16.0	16.53	...	...	1.92
30—34	...	40.4	39.7	52.6	33.2	37.38	42.4	30.8	33.83	37.2	22.7	31.20	32.8	18.4	26.10	19.2	7.4	12.31	...	1.8	2.95
35—39	...	35.6	39.3	...	31.1	46.11	41.3	26.0	36.29	34.6	22.3	29.19	31.7	17.5	26.19	19.7	8.7	12.05	4.6	0.8	2.23
40—44	...	...	44.4	...	25.0	35.65	39.2	21.4	34.01	33.1	17.3	29.17	29.4	15.7	22.53	19.9	8.0	12.83	4.9	1.3	2.33
45—49	...	...	50.0	...	19.7	27.23	...	18.9	33.27	32.0	14.1	27.04	27.5	10.8	22.52	17.1	5.6	11.13	4.6	1.1	2.13
50—54	...	...	...	...	22.2	27.18	...	20.2	35.19	...	12.5	26.89	...	10.2	20.39	...	3.7	9.43	3.9	0.4	1.49
55—59	...	...	...	...	...	27.78	...	15.8	23.42	...	11.2	21.61	...	7.6	20.82	...	3.0	8.79	2.6	0.3	1.61

It must be borne in mind that the year with which we are dealing is the first year of registration in Scotland. In consequence, many births doubtless escaped registration, so that it is safe to conclude that the actual fecundity of the nation was greater than appears in the figures.

Decline of the birth-rate.—Scotland has shared in the decline of the birth-rate which has befallen so many

TABLE XXII.—*Scotland—Birth-rate.*

Year.	Married Women, Aged 15—49, at Date of Census.	Legitimate Births in the Year.	Births per 1000 Married Women.	Unmarried Women and Widows, Aged 15—49, at Date of Census.	Illegitimate Births in the Year.	Births per 1000 Unmarried Women.
1861	352,397	97,080	275	457,744	9,929	21.7
1871	382,290	105,051	275	479,333	11,077	23.1
1881	427,046	115,687	271	523,461	10,484	20.0
1891	452,764	116,339	257	582,583	9,647	16.5
1901	527,311	123,877	235	663,510	8,301	12.5

civilised countries in recent years. The birth-rate is ordinarily stated as a rate per 1000 of the population living at all ages. A more correct estimate is attained by calculating the rate, in the case of the legitimate births, upon the number of married women aged 15-49, and in the case of the illegitimate births, upon the women of the same ages who are not living in the conjugal state. On this basis it is interesting to compare the birth-rate experienced in Scotland in each of the last five census years. These are presented in Table XXII. which shows that the decline in the general birth-rate is shared in by both legitimate and illegitimate sources of population. The legitimate

birth-rate has declined from 275 to 235 per 1000 married women aged 15-49. This is a considerable decline, and means that if the previous rate had been maintained the legitimate births during 1901 would have numbered 145,010 instead of the actual number registered, viz., 123,877. This represents an absolute loss of 21,133 births. The illegitimate birth-rate reveals very striking facts. From a rate of 21.7 per 1000 in 1861 it rose to 23.1 in 1871, and has since very rapidly declined, till in 1901 it stands at only 12.5. If the rate of 1861 had prevailed in 1901, there would have been 14,398 illegitimate births, whereas there were actually only 8301. The deficiency is 6097 births of illegitimate children.

Thus the actual legitimate births amounted to 85 per cent., and the illegitimate births to 58 per cent., of the numbers which would have corresponded to the birth-rates of 1861. The most salient feature of the table is that the fall in the illegitimate birth-rate so much exceeds in relative proportion the serious decline in the legitimate birth-rate.

CHAPTER V

INITIAL FECUNDITY

The initial fecundity of women of different ages.—The fecundity of women at different ages, as dealt with in the preceding chapter, had reference to women who, in many cases, had had varying experiences in reproduction. The fecundity of women at the later ages must have been affected, and most probably diminished, by the fecundity achieved as they passed through the earlier and more fecund ages. Now, therefore, we proceed to eliminate this influence, and to consider the initial fecundity of women at different ages. We mean by initial fecundity the first proof of fecundity, at whatever period after marriage this proof is given by the birth of a first child. In order to compare fairly the initial fecundity of women of different ages, it is necessary to consider only first births.

For this purpose we ascertain the ages at marriage of the women, and the respective periods within which they prove their fecundity by the birth of a living child.

Consider, first, the fecundity of wives in the first

year of marriage. Table XXIII. sets forth, in the usual groups of ages, the number of wives married in Scotland in 1855, the total being 19,680. It would, perhaps, have been more satisfactory had we been able to take for comparison the wives married in 1854; but there was no registration in that year, and

TABLE XXIII.—*Initial Fecundity of Wives.*

Ages of Wives at Marriage.	Number of Wives Married in 1855.	Number of Wives becoming Mothers in First Year of Marriage.	Number of Wives becoming Mothers within Two Years of Marriage.	Total Number of Wives becoming Mothers.	Initial Fecundity in First Year of Marriage.	Initial Fecundity within Two Years of Marriage.	Initial Fecundity at any time after Marriage.
	1.	2.	3.	4.	5.	6.	7.
15—19	3,097	1,478	2,378	2,613	47.72	76.78	84.37
20—24	8,119	4,803	7,351	7,996	59.16	90.54	98.48
25—29	4,958	2,239	3,486	3,844	45.16	70.31	77.53
30—34	1,780	606	1,023	1,205	34.04	57.47	67.70
35—39	908	208	367	444	22.91	40.42	48.90
40—44	488	31	50	64	6.35	10.25	13.11
45—49	202	6	7	9	2.97	3.47	4.46
50—54	88	1	1	1	1.14	1.14	1.14
55 and up'ds.	40	0	0	0	...	...	...
Total .	19,680	9,372	14,663	16,176	47.62	74.51	82.19

no record of the ages at marriage in years earlier than 1855. Perforce, then, we must take the 1855 figures, and probably the results suffer little from this, since the numbers married in 1854 would likely be distributed as to ages in much the same proportions as were ascertained to exist in 1855, and, moreover, would probably not be very many fewer. Since the marriages of 1855 probably exceed those of 1854, the statements in the table are more probably in error

from under-statement than from over-statement of fecundity. Although the mothers of first birth children are not all women married in 1855, large numbers of them are so, and probably the analysis of the primiparæ of this year gives fairly accurately the fecundity of women married at different ages.

In the next column of the table we show the number of wives-mothers within a year of marriage. These have been ascertained from our cards extracted from the registers of 1855. Where the day, month, and year of marriage, and the day and month of birth of first child were both stated, the period was accurately calculated to the nearest half-month. Thus, 10 months and 10 days would be counted 10.5 months, and 10 months and 5 days as 10 months. Where the day of marriage was not given, but the month stated, the marriage was counted as on the middle day of the month. Similarly, when only the year of marriage was stated, marriage was assumed to have taken place on the 30th June, except in the case of the year 1855, where the date of marriage was assumed as the 30th of April. This date was fixed upon for the following reason. It is evident that it would be incorrect to assume the 30th June as the date of marriage when the year of marriage was 1855. In order, therefore, to ascertain what date should be assumed, an examination was made of those cases of births in which the actual date of marriage in 1855 was stated. It was found that among these the marriage took place on the average 4 months after 1st January 1855, and we therefore

made the assumption that when the date was not stated the marriage took place on 30th April. The age of the mother at the birth of the child in 1855 being given, and the date of marriage being given, it was easy to ascertain the age of the mother at marriage. The number of wives-mothers who bore a living child within a year of marriage was ascertained to be 9372. While the large majority of these mothers were youthful, the registers showed that even at later ages fecundity might be promptly demonstrated. One bride of over 50 years of age amply demonstrated her fecundity by having twins within a year.

Column 3 shows the number of wives newly married who became mothers within two years of marriage, while column 4 contains the total number of wives who proved fecund irrespective of the time which had elapsed since marriage. In columns 5, 6, and 7 are shown the percentage fecundities of the wives-mothers detailed in columns 2, 3, and 4 respectively.

It will be seen that brides of 20-24 are more fecund than those of any other age. This is true not only within a short time of marriage, but also when the experience of later years is taken into account. Their fecundity is over 59 per cent. in the first year of marriage, and reaches 90 per cent. within two years of marriage, whilst eventually almost the whole number of such brides prove fecund. The quinquennia on each side of these years also show high fecundity, but as the age at marriage increases fecundity distinctly diminishes. The fact that brides of 15-19 show a

lower initial fecundity than those of 20-24, may be attributed partly to the inclusion amongst the former of a number of immature women, and partly perhaps to a real lower fecundity at these youthful ages. But the table shows that these brides have a higher fecundity than those of any other age except 20-24.

Though the large majority of wives prove their fecundity in a couple of years of married life, it will be seen by comparison of columns 6 and 7 that there are a certain number who require a longer period than this to demonstrate their fecundity. Wives married above the age of 39 show a low fecundity, and at older ages the number of first births is very small. The table shows that at all ages 82 per cent. of the brides ultimately prove fecund; that 74 per cent. are fecund within two years of marriage, and 47 per cent. similarly within one year of marriage.

A study of the table reveals an interesting fact as to the relation existing between the age of the bride at marriage and the period required to demonstrate fecundity. At ages above 24 years the proportion of brides requiring more than 2 years to prove their fecundity increases as the age at marriage advances. This is shown in this comparative table.

Percentage of Fecund Brides who show Fecundity only after Two Years of Marriage.

	Per cent.
Brides aged 20—24	8
„ 25—29	9
„ 30—34	15
„ 35—39	17
„ 40—44	22
„ 45—49	22

CHAPTER VI

MULTIPLE BIRTHS

In this section it is intended to set forth the information obtainable from the 1855 registers in reference to multiple births, and, for comparison, to add one or two observations from other sources. In no case did the number of children at a birth exceed three, and consequently it is not incumbent on us to enter into any discussion as to the occurrence of four or more at a birth.

Triplet births.—During the year 1855 there were 11 triplet births in Scotland. Of these, one was illegitimate, and may be dismissed with the note that the mother's age was 23, that the birth consisted of 3 males, and was stated to be the first delivery of the mother.

In the 10 legitimate triplet births, the ages of the mothers varied from 30-42, and that of the fathers from 30-51. It is commonly stated that triplet births rarely occur in women under 30 years of age, and this is confirmed by the incidence of triplet births in Scotland in 1855. The only case in which the mother's age was below 30 was the illegitimate triplet referred to above.

Table XXIV. shows the combinations of ages of the parents of legitimate triplets in 1855. It also shows the distribution of the sexes amongst the individual components of the triplets, and the number of children born in each family prior to the triplet birth. In 4 cases there were 3 males, in 3 cases 3 females, in 2 cases 2 males and 1 female, and in 1 case 2

TABLE XXIV.—*Legitimate Triplet Births.*

Father's Age.	Mother's Age.	Sex of Triplets.	Number of Children Born before the Triplets.	Number of Years since Marriage.
43	40	3 Females	8	17
40	30	3 Females	3	8
30	32	3 Females	4	9
51	42	3 Males	6	20
42	32	3 Males	5	14
30	32	3 Males	2	8
31	38	3 Males	3	10
42	39	2 Males, 1 Female	9	14
42	35	2 Males, 1 Female	7	14
45	38	2 Females, 1 Male	2	4

females and 1 male. In regard to the distribution of the sexes in triplet births, it seems justifiable to include the illegitimate case. If this is done, it appears that in 8 out of 11 cases of triplets in the same year and nation, the children were not diverse as to sex. There is therefore a strong probability that in any given occurrence of triplets the children will all be of the same sex, either all males or all females. If the same ratio held in other nations and in other years, it would amount to a law of triplet production that in over 70 per cent. of cases the newly-born children are

all of the same sex. The relative ages of the parents may have nothing to do with the occurrence of triplets. The table shows, however, that in 7 of the 10 legitimate cases the father was older than the mother. In these cases the average number of years by which the age of the father exceeded the age of the mother was 7. In the other 3 cases the mother's age exceeded that of the father by an average of nearly 4 years.

Turning now to a consideration of the order of birth in triplet deliveries, it is worthy of notice that none of the legitimate triplets occurred as a first birth, and that the only illegitimate triplet was also the only first-birth triplet. The last column of the table is to be read as follows:—Taking the first instance as an example, a mother had triplets at the age of 40; she had had eight previous children, and the triplets formed the 9th, 10th, and 11th of the family. The eight previous children might represent either eight or a smaller number of previous pregnancies, and there is no means of ascertaining the exact number from the registers. Triplets most frequently occur in women who have previously had 2 or more children. On the average, indeed, it would appear that 5 births precede a triplet birth.

Frequency of triplets.—The frequency of triplets varies in different years and different countries. In this case it is once in 8497 legitimate deliveries; *i.e.*, one mother out of 8497 had triplets. Including the illegitimate deliveries, triplets were produced by 11 mothers out of 92,300; *i.e.*, one in 8391. Triplet births in Scotland from 1855 to 1901, a period of 47

years, numbered 644, and averaged 116 per million confinements.

Twin births.—Frequency of twin births.—The legitimate births of 1855 numbered 85,964, and twins occurred 976 times, and triplets 10 times. Of the 976 cases of twin births, 3 were completed by still-births which were not registered, and therefore not represented in the total births. So that, deducting one in the case of each complete twin birth (973), and two in the case of each triplet birth (20), we have a total of 84,971 legitimate birth transactions in the year by 84,971 fathers and mothers. Of these mothers 976 had twins—a proportion of one twin birth in 87.06 births. The frequency of twins in Scotland in 47 successive years from 1855 onwards to 1901, numbered 11,694 per million confinements.

Twin births are more frequent in legitimate unions than in illegitimate connections. This may be due to the average age of the mothers of illegitimate children being less than that of wives-mothers, and to the tendency for twin births to occur chiefly in women of older years. The mean age of wives-mothers is shown in Table II. (p. 11) as 30.578 years; that of the mothers of illegitimate children is shown in Table XXX. (p. 75) as 25.19 years.

Relation of the age of the mother to twin births.—The number of twins born in 1855 of mothers of different ages is shown in Tables XXV. and XXVI.

Legitimate twins.—These tables deal only with legitimate twins. Table XXV. shows that the ages of the mothers of twins ranged from 18 to 58, that

the greatest number of mothers of twins occurred at 30 years of age, and that the age next prolific of twins was 35. In Table XXVI. these twin births are

TABLE XXV.—*Showing the Ages of the Mothers of the Legitimate Twin Births. Total number*, 976.

Mother's Age.	Number of Cases.	Mother's Age.	Number of Cases.	Mother's Age.	Number of Cases.
18	3	32	59	46	1
19	2	33	44	47	0
20	8	34	58	48	2
21	17	35	66	49	0
22	19	36	59	50	0
23	22	37	46	51	0
24	35	38	43	52	0
25	43	39	26	53	0
26	44	40	41	54	0
27	44	41	15	55	1
28	62	42	14	56	0
29	56	43	8	57	0
30	79	44	9	58	1
31	36	45	2	Not stated	11

TABLE XXVI.—*Showing Fertility in Twins of Wives-Mothers in Scotland in* 1855.

Ages.	Wives-Mothers.	Wives-Mothers of Twins.	Proportion of latter to former, 1 in
15—19	1,667	5	333.40
20—24	16,256	103	157.82
25—29	24,170	253	95.53
30—34	20,802	279	74.56
35—39	14,936	242	61.72
40—44	6,318	87	72.62
45—49	784	5	156.80
50—54	32	0	...
55—59	6	2	3.00
Total .	84,971	976	87.06

arranged in quinquennial groups according to the ages of the mothers. It will be seen that the largest number of wives-mothers of twins occurs in the quinquennium 30-34, and that the previous quinquennium, 25-29, yields the next largest number, though it is closely followed by the quinquennium 35-39. So that, prior to 25 years of age and after 39 years of age, twins are not largely added to the population. These 15 years of age produced 774 out of the 976 cases of twins in the year, or virtually 80 per cent. of the whole. Far more twins are born of mothers over 30 than under 30: the twin-bearer is appreciably older than the average mother. Of the 976 mothers, 615 were 30 and over, and only 361 were under 30, a difference of 254 to the credit of the older wives. Reference to p. 11 will remind the reader that the fertility of wives under 30 is greater than the fertility of wives over 30. The mean age of the 83,959 wives-mothers with ages stated was on p. 10 found to be 30.578 years, whereas the mean age of 965 twin-bearers whose ages are stated is ascertained to be 32.26. Of the whole 84,971 wives-mothers in the country some 47 per cent. were over 30.5, while of the 976 wives-mothers of twins 59 per cent. were over 30.5.

Illegitimate twins. — The ages of the mothers of illegitimate twins ranged from 18-40, as shown in Table XXVII., and there were 74 cases of such twins amongst the 7329 mothers. This gives a frequency of one twin birth in 99 deliveries, a lower proportion than in the case of legitimate deliveries,

The greater number of illegitimate twins occur to mothers under 30; thus of the 74 cases only 18 may be attributed to mothers aged 30 and upwards, while

TABLE XXVII.—*Illegitimate Twin Births.* 74 *Cases.*

Age of Mother.	Number of Cases.	Age of Mother.	Number of Cases.
18	1	30	4
19	4	31	1
20	5	32	2
21	5	33	0
22	6	34	1
23	7	35	3
24	2	36	0
25	4	37	2
26	4	38	1
27	8	39	1
28	6	40	2
29	2	Not stated	3

56 are born of mothers under 30. This is a complete reversal of the incidence of twins amongst legitimate mothers, and shows that 75 per cent. of illegitimate twins are the produce of mothers under 30. Amongst illegitimate births, as amongst legitimate, the mean age of the twin-bearers is higher than the mean age of the whole bearers. Thus the mean age of 7118 mothers of illegitimate children (whose ages were stated) is 25.19 years, whereas of 71 mothers of illegitimate twins (whose ages were stated) the mean age is 26.85. It is interesting to note that the twin-bearer exceeds in average age the years of the average mother by about one and a half years, whether the birth be legitimate or illegitimate; the figures in the one case being 32.26-30.58 = 1.68, and in the other case

26.85-25.19=1.66. Moreover, the mean age of the wives-mothers exceeds the mean age of the mothers of illegitimate children by about $5\frac{1}{2}$ years, and the mean age of the wives-mothers of twins exceeds the mean age of the mothers of illegitimate twins by the same number of years. The actual figures are in the one case 30.58-25.19=5.39, and in the other case 32.26-26.85=5.41.

TABLE XXVIII.—*Showing the Ages of the Fathers of Legitimate Twin Births.*

Father's Age.	Number of Cases.	Father's Age.	Number of Cases.	Father's Age.	Number of Cases.
19	1	37	42	55	9
20	4	38	47	56	2
21	6	39	34	57	1
22	12	40	47	58	2
23	21	41	31	59	1
24	25	42	29	60	3
25	25	43	26	61	3
26	37	44	30	62	1
27	45	45	16	63	0
28	43	46	12	64	1
29	42	47	13	65	0
30	47	48	12	66	0
31	29	49	4	67	0
32	52	50	9	68	1
33	45	51	2	86	1
34	38	52	5	Not stated	4
35	58	53	4		
36	52	54	2	Total .	976

Relation of the age of the fathers to twin births.—Though the age of the father may have no influence on the occurrence of twin births, the information at our disposal enables us to give it in the case of legitimate twin births. It is therefore put on record in Table XXVIII., and may hereafter prove useful

for comparison. The ages range from 19-86, or, since the latter age refers to one exceptional case and there are no other cases later than the age of 68, it may be better to consider the ages as ranging from 19-68. The great majority of the fathers are over 30 years of age, 714 being over 30 as compared with 262 at younger ages. The age which shows the greatest number of fathers is 35, and the numbers above and below this age are fairly equal. The mean age of the husbands-fathers of twins (whose ages were stated) exceeds the mean age of husbands-fathers as a whole (whose ages were stated) by $1\frac{3}{4}$ years, the figures being 35.68-33.94=1.74. This is almost exactly the same period as that by which the wives-mothers of twins are senior to the wives-mothers as a whole. This is a curious fact, which, as far as we are aware, has never previously been noted. The figures dealt with are sufficiently large to make the point probably a true representation of the facts. The mean age of the whole husbands-fathers is taken from Table VI. (p. 16), and is calculated upon 84,560 husbands-fathers, while the mean age of the twin-begetters is calculated upon the 972 of these who were fathers of twins, and whose ages were stated. The exceptional case in which the father was stated to be 86, was one in which the mother was aged 30, and it may be granted that such a case requires more proof than is now available, or than is furnished by registration unsupported by other evidence.

Fertility in twins.—Fertility in twins may be regarded either in relation to the whole wives in

the population or to the wives-mothers in the population.

Fertility in twins of wives as a whole.—In Table XXIX. will be found means for judging of the fertility in twins of the whole female married population at child-bearing ages in Scotland in 1855. Wives aged 15-59 are here compared as to their fertility in twins. The number of wives of these ages

TABLE XXIX.—*Showing Fertility in Twins of the Married Women in the Population.*

Ages.	Wives in Population, 1855.	Wives-Mothers of Twins.	1 in
15—19	3,261	5	652
20—24	38,078	103	370
25—29	66,066	253	261
30—34	68,786	279	246
35—39	61,712	242	255
40—44	55,784	87	641
45—49	43,302	5	8,660
50—54	37,457	0	...
55—59	23,861	2	11,930
Total .	398,307	976	408

is estimated as 398,307, and this number is divided into components for each quinquennial period from 15-59. The figures in this column are obtained from Table XIV. (p. 29). The next column in the table shows the number of wives-mothers of legitimate twins in Scotland in 1855. The figures are the same as in Table XXVI. (p. 64). The final column of the table shows the number of wives at each quinquennial period of whom one is a twin-bearer.

The table shows that of the whole child-bearing wives in the population, 1 in every 408 annually becomes a twin-bearer. The fertility in twins varies very much with the age of the wives. Fertility in twins increases as the age advances, until it reaches its climax in the quinquennium 30-34; at that period 1 in every 246 wives is a twin-bearer. The fertility persists in the next quinquennium, where 1 in every 255 wives is a twin-bearer, so that the decade 30-39 is much the most productive of twins. Under 20 and over 40 the fertility in twins of the whole wives in the population is small.

It is interesting to compare this table with Table XI. (p. 23), which shows the general fertility of the whole female population. At the age 30-34, fertility in general and fertility in twins coincide in being at their climax. But whereas fertility in general in the whole female population is next highest at the preceding quinquennium, 25-29, in the cases of wives fertility in twins is next highest at the following quinquennium, 35-39.

Fertility in twins of wives-mothers.—There is no relation between the fecundity of wives and their fertility in twins. If Tables XIV. and XXIX. be compared, it will be seen that wives are most fecund at early ages prior to 30 years, whereas they are most fertile in twins at ages between 30 and 40 years. Wives under 20 seldom have twins, yet they are highly fecund. Matthews Duncan's conclusion, that wives under 20 have more fertility in twins than wives of 20-29, is not confirmed by the figures for the whole

country. His misconception is due to the fact that 3 mothers under 20 had twins in Edinburgh and Glasgow alone, whereas there were only 5 such cases in the whole country. The wives aged 15-19 in the cities were estimated as 756, giving his proportion of 1 in 252 as twin-bearers. But in reality there were in the country 3261 wives aged 15-19, and of these only 5 were twin-bearers, or 1 in 652. In the next process of inquiry we compare the wives-mothers of various ages as to their fertility in twins. Table XXVI. (p. 64) shows in quinquennial periods during the child-bearing ages—(1) the number of wives-mothers, as ascertained in Table III. (p. 13); (2) the numbers of wives-mothers of twins; (3) the number of wives-mothers out of whom one will annually be a twin-bearer.

The lessons to be learned from a study of the table are—(1) that fertility in twins of wives-mothers gradually increases up to a climax at the age of 35-39. (2) That it remains high even after 40, and vanishes rapidly after the age of 44. Duncan limits the fertility of wives-mothers in twins after the age of 40, but his conclusion is shown by our tables to be based on insufficient data. This is one of the errors due to the limitation of his inquiry to urban experience, and vanishes when the whole country is considered. Mothers of 40-44 are certainly less fertile in twins than those of 35-39, but more fertile than those of any other age, although mothers of 30-34 nearly equal them in such fertility. (3) That mothers of 15-19 are less fertile in twins than mothers

at any other age, and that mothers of 20-24 and 45-49 have alike small fertility in twins, although their fecundity is so profoundly different. (4) That fertility in twins is inverse to fecundity in general; *i.e.*, the former increases and the latter decreases as the age of the wife-mother advances.

CHAPTER VII

ILLEGITIMATE BIRTHS

THE illegitimate births of 1855 numbered 7405, and included one case of triplets and 74 of twins. The number of mothers of illegitimate children therefore amounted to 7329.

Proportion of illegitimate to legitimate births.—The proportion of illegitimate to legitimate births in 1855 was therefore 7405 to 85,964, or one illegitimate birth to every 11.61 legitimate births, or one in 12.61 of the total births. Stated as a percentage of the total births, the illegitimate births form 7.93 per cent. This is not a good method, of comparing the illegitimate births with the total births, since both factors are variable.

Illegitimate birth-rate.—The illegitimate birth-rate should be calculated upon the unmarried women, or women not living in the conjugal state, at child-bearing ages. The rate should be estimated per 1000 of these women, as in the case of a legitimate birth-rate calculated per 1000 married women at child-bearing ages. The child-bearing ages may be taken as comprised within seven quinquennia, from 15 to

49 years inclusive. This is preferable to limiting the child-bearing ages to the thirty years from 15-44 inclusive, as not a few legitimate births, and even some of the illegitimate births, occur at and after 45 years of age. Our investigations enable us to submit an illegitimate birth-rate calculated in this way. In Table XI. (p. 23) we have estimated to the middle of 1855 the female population comprised within the ages 15-59. The total is 902,370, and deducting from this figure the women aged 50-59, we have 788,954 as the number of women aged 15-49. But this figure includes the married women, who must also be deducted in order to find the population of unmarried women in which the illegitimate births occurred. By a similar process, Table XIV. (p. 29) supplies us with the number of married women aged 15-49 as 336,989. Deducting, then, from the 788,954 the number 336,989, we have 451,965 as the number of unmarried women at child-bearing ages in the middle of 1855. The 7405 illegitimate births produced by 451,965 of such women gives an illegitimate birth-rate of 16.38 per 1000.

Ages of the mothers of illegitimate children.—Table XXX. shows that the stated ages of the mothers of illegitimate children varied from 14-47. Besides this, there were 211 mothers whose ages were not stated. The mean age of 7118 mothers whose ages were stated was 25.19 years. This is fully 5 years less than the mean age of the mothers of legitimate children (see p. 10). Turquan found that in France in 1892 the mean age of the mothers

of illegitimate children was 25.75 years, and was less by 4 years than the mean age of the wives-mothers in the same year. The maternal age which contributes most illegitimate births to the population is 22; the numbers rise to a climax at that age

TABLE XXX.—*Showing the Ages of the Mothers of Illegitimate Children born in Scotland in* 1855.

Mean Age, 24.69 +.5 = 25·19 Years.

Age.	Number.	Age.	Number.	Age.	Number.
14	2	27	310	40	54
15	4	28	340	41	12
16	31	29	219	42	18
17	111	30	298	43	10
18	293	31	118	44	5
19	503	32	133	45	9
20	591	33	109	46	2
21	689	34	92	47	1
22	704	35	104	Not stated	211
23	581	36	86		
24	580	37	65	Total .	7329
25	503	38	60		
26	447	39	34		

and thereafter decline. This is 6 or 8 years earlier than the maternal age which furnishes most recruits to the legitimate births, according as one considers that age 28 or 30. The quinquennium 20-24 contributes over 40 per cent. of the total number of illegitimate births, and the quinquennium 25-29 accounts for a further 25 per cent. Of the 7405 illegitimate births, 3791 were male and 3614 female. The proportion of the sexes at birth in relation to the ages of the mothers will be discussed in a later chapter.

Ages of all mothers in Scotland in 1855.—By combination of Tables I. and XXX. it is possible to arrive at the ages of all the mothers. This is done in Table XXXI., which shows that there were altogether 92,300 mothers in Scotland in 1855. Their stated ages ranged from 14-58, and the individual age of 30 shows the largest number.

TABLE XXXI.—*Showing the Ages of the Mothers of Children* (*Legitimate and Illegitimate*) *in Scotland in* 1855.

Age.	Number of Mothers.	Age.	Number of Mothers.	Age.	Number of Mothers.
14	2	30	6,049	46	191
15	7	31	3,425	47	86
16	54	32	4,440	48	62
17	243	33	3,712	49	18
18	768	34	3,680	50	16
19	1,518	35	4,112	51	5
20	2,400	36	3,453	52	7
21	3,050	37	2,649	53	1
22	4,298	38	2,842	54	3
23	4,350	39	2,038	55	2
24	5,120	40	2,546	56	1
25	5,245	41	1,211	57	1
26	5,300	42	1,253	58	2
27	4,901	43	734	Not stated	1,223
28	5,748	44	588		
29	4,518	45	428	Total .	92,300

CHAPTER VIII

FIRST BIRTHS

In regard to the order of birth, our figures do not entirely coincide with those tabulated in the Supplementary Report of the Registrar-General. The differences have arisen largely from a variation in the practice of the local registrars. Some included in the statement of issue of a marriage the particular birth registered in 1855, whilst others regarded that column of the register as applicable to previous issue only. Unless, therefore, the order of birth was explicitly stated, it was difficult to estimate it correctly. Careful attention was directed to each card before it was assigned to its destined order, and we believe that our figures represent the facts with fair accuracy. The legitimate first births of 1855 numbered 16,325 out of a total of 85,964 births. Thus they form 19.00 per cent. of the total births. We shall see later that the percentage varies at different ages of the parents.

Ages of the parents of first births.—Table XXXII. gives a somewhat elaborate analysis of the 16,325 first births. It shows the respective ages of the

TABLE XXXII.—*Total Legitimate First Births.*

Mothers' Ages.		Fathers' Ages. 15—19.	20—24.	25—29.	30—34.	35—39.	40—44.	45—49.	50—54.	55—59.	60—64.	65—69.	70—74.	Total Males.	Total Females.	Percentage First Births to Total Births.
15—19	M	80	471	135	26	15	2	1	...	1	...	...	...	731	...	86.72
	F	**73**	**421**	**173**	**39**	**5**	**4**	**4**	...	...	...	...	...	...	**719**	
20—24	M	68	1,951	1,401	396	130	46	10	10	1	1	...	...	4,014	...	47.40
	F	**52**	**1,862**	**1,287**	**349**	**124**	**47**	**13**	**3**	**1**	...	**1**	...	...	**3,739**	
25—29	M	9	410	1,028	537	248	87	49	15	4	1	...	...	2,388	...	19.19
	F	**8**	**438**	**1,019**	**471**	**221**	**83**	**33**	**15**	**6**	**4**	...	**1**	...	**2,299**	
30—34	M	3	43	173	284	152	98	53	17	7	2	1	...	833	...	7.71
	F	...	**47**	**178**	**265**	**146**	**90**	**35**	**26**	**5**	**2**	...	...	...	**794**	
35—39	M	...	4	28	45	91	74	38	19	13	6	2	1	321	...	4.14
	F	...	**4**	**27**	**41**	**71**	**65**	**42**	**29**	**21**	**6**	**2**	...	...	**308**	
40—44	M	...	...	5	5	8	27	15	12	5	2	...	...	79	...	2.47
	F	...	**2**	**2**	**6**	**13**	**20**	**17**	**12**	**2**	**4**	**1**	...	...	**79**	
45—49	M	...	...	...	1	2	1	3	2	1	...	...	...	10	...	2.28
	F	...	**1**	...	...	...	...	**3**	**3**	**1**	...	...	...	...	**8**	
50—54	M	...	...	...	...	...	...	...	...	...	...	...	...	...	...	(3.13)
	F	...	...	...	...	...	...	...	...	...	...	**1**	...	...	**1**	
55—59	M	...	...	...	...	...	...	...	...	...	1	...	...	1	...	(25.00)
	F	...	...	...	...	...	...	...	...	...	**1**	...	...	...	**1**	
Total .	M	160	2,879	2,770	1,294	646	335	169	75	32	13	3	1	8,377	...	...
Total .	F	**133**	**2,775**	**2,686**	**1,171**	**580**	**309**	**147**	**88**	**36**	**17**	**5**	**1**	...	**7,948**	...
Total .	...	...	...	...	...	...	...	...	...	...	...	...	...	16,325		19.00

parents in quinquennial groups, the sex distribution of the first births at these ages, and the percentage of first births to total births. A summary is here given of the ages of the parents of first-birth children.

Quinquennial Ages.	Children born of Mothers.	Children begotten by Fathers.
15—19	1,450	293
20—24	7,753	5,654
25—29	4,687	5,456
30—34	1,627	2,465
35—39	629	1,226
40—44	158	644
45—49	18	316
50—54	1	163
55—59	2	68
60—64	...	30
65—69	...	8
70—74	...	2
	16,325	16,325

Considering first the ages of the parents, and primarily those of the mothers, we find that mothers of 20-24 yield by far the largest number of first-birth children, nearly half of all the first births being accounted for by mothers in this quinquennium. Fully a fourth of the first births are supplied by mothers in the next quinquennium, 25-29, so that the decade 20-29 supplies three-fourths of all the first births. The quinquennium 30-34 provides more first births than the quinquennium 15-19, and after 40 the number of first births is small. There were 2 cases of first births in mothers over 50, and one of these was a twin delivery, a circumstance

sufficiently rare to make it worthy of passing mention. The ages of the fathers of first-birth children differ slightly from those of the mothers. Thus there are few fathers in the age-group 15-19 compared with the mothers in that age. Only 293 first children were begotten by fathers under 20, whereas 1450 were born by mothers who had not reached 20 years of age. At the next quinquennium also, more first children are born of mothers of 20-24 than are begotten by fathers 20-24. Thereafter at each quinquennial period, the numbers begotten by the fathers of that age are greater than the numbers born by mothers of the same age.

Sex distribution of first births.—The 16,325 first births consisted of 8377 males and 7948 females, the excess of males therefore was 429 in 16,325 births. This is in accordance with the ordinary experience of the proportion of the sexes at birth, and will be more fully discussed, under the term masculinity, in connection with the total births. Meanwhile we are only concerned with the first births, and with the observed facts of their sex distribution. Table XXXII. shows that mothers under the age of 40, taken *en masse*, produce more males than females at first births. This is true at each quinquennium up to and including that of 35-39 years. The mothers who at 40-44 years produce their first children find their issue equally divided between the sexes. At 45-49 the numbers of the respective sexes are nearly equal; there is a slight preponderance in favour of the males, but the total first births in this quinquennium are too few

upon which to found any judgment. It will probably be wise to regard this quinquennium as resembling the preceding quinquennium in producing at first births an equal number of each sex.

With regard to the age of the mother, it is clear, then, (1) that the main child-bearing ages produce more males than females as first births; (2) that after 40 years of age is reached this disparity disappears.

The ages of the fathers of first-birth children differs from that of the mothers in its relation to the sex of the offspring. The excess of male first births occurs to fathers under 50, but fathers over 50 show an excess of female first births. This excess of female first births when the male parent is over 50 may be explicable by some paternal influence, or by the fact that the primipara with a husband over 50 is not generally in the first bloom of youth. We shall consider in a later chapter the masculinity of first births at various combinations of the ages of the parents. Here the only reference is to the husbands and wives of each quinquennium as a whole. To husbands over 50 may be assigned an excess of female first births with wives of all ages combined. To husbands under 50 an excess of male first births occurs with wives of all ages combined. By wives under 40, first-birth males exceed females, taking all ages of husbands together; but by wives over 40 and husbands of all ages, the sexes are equally likely to occur as first births.

Percentage of first births to total births.—The first births numbered 16,325 out of a total of 85,964; that

is, the first births formed 19.00 per cent. of the total births. Broadly speaking, about one-fifth of the annual recruits to the population are derived from primiparæ. The proportion thus stated refers to mothers of all ages. The percentages which first births form of the total births at each quinquennium vary exceedingly, according to the ages of the mothers. Thus with mothers of 15-19 years, 86.72 per cent. of the children are first-fruits. With mothers of 20-24 the births are fairly divided between first and subsequent births; for there are 47.40 per cent. of first births. At later ages the first births form a decreasing proportion of the total births, a proportion which decreases progressively up to the end of the child-bearing period of life at 45-49 years. The percentage which first births form of the total births is only about 2 per cent. in the case of mothers over 40. True, our investigations as to 1855 show that even after the age of 50 a first birth may chance to occur, but births of any kind after the age of 50 are unusual. It is not, therefore, conclusive or important if the table shows at ages 50-54 a somewhat higher percentage of first births than at ages between 40-49. There were only 8 children in 1855 whose mothers were aged 55-59, and when 2 of these happen to be first-birth twins, they introduce irregularity into an otherwise satisfactory column.

CHAPTER IX

PRIMARY FERTILITY

Primary fertility of wives married at various ages.—In dealing with initial fecundity, we have necessarily considered only the fact of birth achieved by all those wives who are not permanently sterile. We have not considered the number of children produced at a first birth by these wives. We now, therefore, take into account the primary fertility of wives, *i.e.*, the number of first-birth children born to wives married at various ages. This of course differs from the number of fecund wives by the additional children produced in multiple births. Since multiple births are more common at the later reproductive ages than at the earlier ages, it may be expected that the fertility figures will proportionally exceed the fecundity figures more at later ages than at earlier ages. The following tables will enable us to see if this is so ; that is to say, if first-birth multiple births occur more commonly to wives married at advanced ages than to youthful brides. First we submit a table (XXXIII.) showing the age of the mothers at marriage and the number of first-birth children born within one year,

within two years, and later than two years. The ages of the mothers at marriage are stated in the usual quinquennial groups. The number of children

TABLE XXXIII.—*Showing ratios between First-born Children and Wives Married at Various Ages.*

Ages at Marriage.	Wives Married in 1855.	First Births within 1 Year.	First Births within 2 Years.	First Births after 2 Years.	Total First Births.	Percentages.			
						Col. 3 to Col. 2.	Col. 4 to Col. 2.	Col. 5 to Col. 2.	Col. 6 to Col. 2.
1	2	3	4	5	6	7	8	9	10
15—19	3,097	1,484	2,384	237	2,621	47.92	76.98	7.65	84.63
20—24	8,119	4,844	7,406	655	8,061	59.66	91.22	8.07	99.29
25—29	4,958	2,270	3,538	360	3,898	45.78	71.36	7.26	78.62
30—34	1,780	615	1,036	182	1,218	34.55	58.20	10.23	68.43
35—39	908	213	375	77	452	23.46	41.30	8.48	49.78
40—44	488	31	50	14	64	6.35	10.25	2.87	13.12
45—49	202	6	7	2	9	2.97	3.47	.99	4.46
50—54	88	2	2	...	2	2.27	2.27	...	2.27
Totals	19,640	9,465	14,798	1,527	16,325	48.19	75.35	7.78	83.13

is ascertained by taking the number of wives-mothers and adding one for each case of twins. It will be noticed that the total twin additions amount to 149, although there were actually 152 cases of first-birth twin births. The reason of this apparent discrepancy is that stillbirths were not registered, but that in three cases the twin birth was composed of the birth of a registered live child and of an unregistered still-birth. Thus there were three cases of first-birth twins represented by only one card, and for these no addition is allowable. Of the 152 cases, 95 were within one year of marriage, 42 in the second year, and 15 later than two years. The total first births number 16,325,

of which 14,798 occurred within two years of marriage and 1527 later than two years after marriage. That is to say, about 9 per cent. of the first births are delayed to a period of over two years after marriage. The ratios between the first births and the wives married at various ages are shown in detail in the table. It shows that the primary fertility of the mass of brides aged 20-24 is higher than that of brides of any other age-group. It is, however, most nearly approached by that of brides aged 15-19, and after the age of 25 the primary fertility diminishes gradually to the age of 39. There is then a very marked and sudden fall of primary fertility, which is small in brides of 40 and over, and which gradually diminishes until its final disappearance about ten years later. A general survey of the results of this comparative table shows that in the first year of marriage younger brides are more fertile than those married at later ages. Of all wives married under 30 and ultimately fertile, nearly 60 per cent. prove their fertility within one year of marriage. Of those married over 30, scarcely 50 per cent. are fertile in the same period. On the other hand, of the brides between 30 and 40, a larger proportion prove fertile more than two years after marriage than is the case with brides under 30. Brides of the mature age of 40 or more years, if fertile at all, are so within two years in most cases. In view of the near approach of the menopause, this is a natural phenomenon.

We are fully aware that the figures as to the number of wives proving fertile within one year

of marriage are at all ages too high, owing to the frequent postponement of marriage until pregnancy has occurred. All such statistics are marred by, and require correction for, antenuptial conceptions. It is evident that the figures covering a period of two years after marriage are more reliable than those referring to the first year only. This subject of antenuptial conceptions obtains fuller treatment in a later chapter.

Returning for a moment to the frequency of occurrence of first-birth twins as an indication of primary fertility, it is certainly the case that mothers of first-birth twins are more common among brides over 25 than under that age. This is shown in the following table thus :—

TABLE XXXIV.—*Frequency of First-Birth Twins. Scotland,* 1855.

Age at Marriage.	15—19.	20—24.	25—29.	30—34.	35—39.	40—44.	45—49.	50—54.	Total, all Ages.
Number of wives-mothers of first-birth children .	2,613	7,996	3,844	1,205	444	64	9	1	16,176
Number of wives-mothers of first-birth twins . .	8	66	56	13	8	0	0	1	152
Proportion of latter to former—1 in .	327	121	69	93	56	...	...	1	106

Primary fertility in twins at different ages.—The incidence of twins as a first birth within two years of marriage is shown in Table XXXV., from which

TABLE XXXV.—*Showing comparison between Wives Newly-married and Mothers of First-birth Twins within Two Years of Marriage.*

Ages at Marriage.	15—19.	20—24.	25—29.	30—34.	35—39.	40—44.	45—49.	50—54.	55 and upwards.	Totals.
Number of wives newly-married	3,097	8,119	4,958	1,780	908	488	202	88	40	19,680
Number of mothers of first-birth twins within two years of marriage	6	56	53	13	8	...	...	1	...	137
Proportion of latter to former —1 in	516	145	94	137	114	...	...	88	...	144

TABLE XXXVI.—*Showing comparison between Mothers within Two Years of Marriage and Mothers of First-birth Twins within Two Years of Marriage.*

Ages at Marriage.	15—19.	20—24.	25—29.	30—34.	35—39.	40—44.	45—49.	50—54.	Totals.
Number of mothers within two years of marriage . .	2,378	7,351	3,486	1,023	367	50	7	1	14,663
Number of mothers of first-birth twins within two years of marriage	6	56	53	13	8	...	...	1	137
Proportion of latter to former —1 in	396	131	66	79	46	...	...	1	107

it appears that 1 in every 144 brides produces twins within that period. The occurrence is most common to brides aged 25-29, and is more likely also with brides of 30-39 than with brides under 25. The wives newly-married, however, contain a certain number of sterile women, and it is therefore more useful to compare the mothers of first-birth twins with mothers in general. This is done in Table XXXVI., which shows that of those brides who became mothers within two years of marriage, 1 in 107 bore twins. That twins are more frequent at mature ages is demonstrated by the figures which show that of women married at 35-39, and having a child within two years, 1 in 46 has first-birth twins. In fact, the table indicates that the older the bride who within two years of marriage emphasises her fecundity, the greater the probability that the first birth will be twins. This is in accordance with the conclusions as to multiple births as a whole, already discussed in Chapter VI.

CHAPTER X

ORDER OF BIRTH

Order of birth.—One of the most important details revealed in the registers for 1855 is the order of birth of the individuals born in that year. This tells us how many of the births were first, second, third, etc., and shows in what degrees the population is recruited respectively from primary and from sustained fecundity of the parents. Table XXXVII. shows the order of birth of the 85,964 legitimate children born in 1855, and the percentage of the whole contributed by each order. The table shows that in the great majority of cases it has been possible to ascertain from the registers the order of birth. In only .26 per cent. are we unable to find the order of birth. All other births are included in an order of birth ranging from the first to twentieth child. First births constituted 19 per cent., or nearly one-fifth of the total births, and provide a higher proportion of the total than any other order of birth. The percentage contribution diminishes steadily from the first to the twentieth in order. First, second, and third births together represent 50½ per cent. of the total births, and fourth, fifth, and sixth births

TABLE XXXVII.—*Order of Birth.*

Order of Birth.	Children born in Scotland, 1855.	Percentage of the Total.	Fall in Percentage in successive orders.
1	16,325	19.00	...
2	13,830	16.09	2.91
3	13,186	15.34	0.75
4	10,950	12.74	2.60
5	9,017	10.50	2.24
6	7,084	8.24	2.26
7	5,429	6.31	1.93
8	3,975	4.62	1.69
9	2,702	3.14	1.48
10	1,589	1.85	1.29
11	913	1.06	0.79
12	435	0.50	0.56
13	183	0.21	0.29
14	70	0.08	0.13
15	38	0.04	0.04
16	10	0.01	0.03
17	6	0.006	...
18	2	0.002	...
19	...	...	...
20	2	0.002	...
Unknown	218	0.26	...
Total .	85,964	100.00	...

TABLE XXXVIII.—*Order of Birth.*

Order of Birth.	Number of Mothers.	Proportion to 1000 Mothers of First Births.	Order of Birth.	Number of Mothers.	Proportion to 1000 Mothers of First Births.
1	16,176	1,000	12	430	27
2	13,719	848	13	182	11
3	13,048	806	14	70	4
4	10,808	668	15	38	2
5	8,907	551	16	9	0.5
6	6,987	432	17	6	0.3
7	5,351	331	18	2	0.1
8	3,909	242	19	0	0.0
9	2,643	163	20	2	0.1
10	1,567	97	Un-	215	...
11	902	56	known		
...	...	...	Total .	84,971	...

account for 31½ per cent., while seventh, eighth, and ninth births form 14 per cent. of the total births. So that 96 per cent. of the total births are lower than tenth in order of birth, and 99.5 per cent. are represented by first to twelfth children.

The percentage represented by first births considerably exceeds that of the second births ; there is a decline of 2.91 between the percentage of these two orders, and this is a larger decline than exists between any other two orders. It is notable that the third births contribute almost as much as the second births to the recruiting of the population. The birth of two children leaves the fecundity of the married couples almost as vigorous as after the birth of one child. The birth of one child diminishes fruitfulness, whereas, when two births have been accomplished, the fecundity of those couples with two children is quite likely to be further proved by the birth of a third. After the third birth there is a distinct fall in the fecundity, almost as large as the fall after the birth of one child. After the fourth and fifth births the fall still exceeds 2 per cent. Thereafter a steady decline takes place. Whilst the largest number of mothers who contribute to the increase of the population in any year are performing their duty for the first time, there are others who have in previous years had children. The comparative numbers of such mothers have been tabulated in Table XXXVIII. for each order of birth. Thus for every 1000 mothers who in 1855 had their first child there were 848 who bore a second child, while there were only 2 who had attained the number of fifteen children.

CHAPTER XI

AVERAGE NUMBER OF CHILDREN TO A MARRIAGE

THE average number of children to a marriage is usually ascertained by dividing the annual number of births by the number of marriages in a preceding year. The marriages of the year immediately preceding were at first taken, but later Dr Farr pointed out that a more accurate result would be arrived at by taking the number of marriages at a period of 6 years prior to the year in which the births occur. By this method the number of children to a marriage is stated in the returns of the Registrars-General for Great Britain. It may be interesting to point out that our extracts from the registers of 1855 enable us to arrive by another method at the average number of children to a marriage. Our figures only deal with those families to which a birth addition was made during 1855, but these may be taken as a fair sample of the whole fruitful families in Scotland. Having ascertained the number of families consisting of one child born in 1855, and the number of families whose second child was born in 1855, and so on, up to the twentieth child, we find that we have positive details as to

84,756 of the existing fecund marriages in Scotland in 1855. Barren marriages are expressly excluded, since these are not disclosed in the birth registers. These 84,756 families aggregated 340,943 children, or an average of 4.0226 children per family.

CHAPTER XII

CHRONOLOGY OF BIRTHS

UNDER the heading chronology of births, we propose to direct attention to the following different subjects. (*a*) The average interval by which marriage precedes the birth of the first child. (*b*) The average interval between marriage and the births of successive children. (*c*) The average number of children produced by persistently-fertile mothers, according to the period since marriage. (*d*) The distribution of births, according to the order of birth and the duration of marriage. (*e*) The occurrence of multiple births in relation to the duration of marriage.

(*a*) *The interval by which marriage precedes the birth of a first child.*—This period in Scotland is very frequently curtailed, and in fact non-existent. The law whereby children born before marriage are legitimated by the subsequent marriage of their parents, accounts in part for the frequency with which the birth of the first child precedes matrimony. We have found that in very many cases this must have happened; for on analysis of the subsequent births many of the second, third, and even later births have

occurred to parents married only in 1855. Moreover a certain number of the first births registered in 1855 showed on comparison of the date of birth with the date of marriage that the birth had preceded the ceremony of marriage. The occurrence of numerous cases of first birth within 7 months of marriage evidenced the custom in certain classes of society of postponement of marriage until after pregnancy had been achieved.

Analysis of the details concerning 16,176 mothers of first-birth children in 1855 shows that in 1.8 per cent. the birth preceded marriage, and further, that in 21.3 per cent. the birth occurred within 7 months of marriage. An additional 13.5 per cent. of the mothers had their first-birth children within 7-9 months of marriage, and many of these children must have been conceived before marriage. So that it is probably within the mark to say that in one-third of the marriages (sterile marriages excepted) the bride had had a child while unmarried, or was pregnant at the time of marriage. Issue was therefore largely assured before legal matrimony. Antenuptial conception is also common in other countries. Westergaard states that among the peasant population in the rural districts of Denmark 39 per cent. of the first-born were born within 7 months from marriage, and an additional 9 per cent. between 7 and 9 months after marriage (of whom many must have been conceived before marriage). Indeed, he comes to the conclusion that in some two-thirds of the fertile marriages in this

class of Danes the brides had had children while unmarried, or were pregnant at the time of marriage.

In New South Wales also this question has been investigated, and it appears that in that colony about 30 per cent. of the legitimate first births are the product of antenuptial conceptions.

The great fecundity of the mass of Scottish wives is shown by the fact that 54 per cent. of the mothers of first-birth children demonstrated their fecundity in

TABLE XXXIX.—*Period between Marriage and First Birth.*

Age of Mother at Marriage.	Average Period in Months.	
	Crude.	Corrected.
15—19	13.73	18.35
20—24	13.02	17.86
25—29	13.10	17.20
30—34	15.62	20.06
35—39	16.03	20.50
40—44	16.70	22.67
45—49	15.06	20.16
All ages	13.45	18.06

the period of 9-24 months after marriage. Only the small proportion of 9 per cent. delayed for more than 2 years after marriage their first addition to the population.

The average interval between marriage and parturition in the 16,176 first deliveries is shown in Table XXXIX. This interval was calculated in months for the first 2 years after marriage, and thereafter in years. The average period in months

elapsing between marriage and the birth is stated relative to the age of the mother at marriage. For the whole 16,176 primiparæ the average period was 13.45 months.

Influence of the age of the mother at marriage.—The age of the mother at marriage notably influences the period which elapses before fecundity is demonstrated by the birth of a first child.

The brides married over 30 show, however, a longer period than the average, whilst those of 20-29 show a shorter period. Brides of 15-19 exhibit a mean period of 13.73 months, a figure slightly above the average, and distinctly above that taken by those aged 20-29. This fact is probably due in part to immaturity of certain of the brides, and in part, perhaps, to antenuptial conception being more common in the elder group. From the age of 30 upwards there is a progressive increase in the length of the average interval. All these averages are affected, more or less seriously, by the inclusion of antenuptial conceptions. A more correct estimate of the interval is obtained by excluding all cases in which less than 9 months elapsed between marriage and the first birth. The average period, as thus corrected, is also shown in the table. These figures probably more nearly represent the actual facts than the former. There is no reason to attribute to those wives who conceived before marriage any greater fecundity than their sisters who awaited legal sanction. In the former, the period between the commencement of sexual intercourse and the birth of

a first child is probably much the same as is the period between marriage and the birth of a first child in the latter. The nuptial age which is likely to see a bride converted most speedily into a mother is 25-29, the average interval in the case of these wives being 17.2 months. Brides of 20-24 come next, with an average interval of 17.86 months. Note that the correction for antenuptial conceptions has inverted the order of these two age-groups. Brides of 15-19 now show a very distinctly longer interval than brides of 20-29, and take 18.35 months to prove fecundity. Brides in age-groups under 30, however, all take less than 20 months, whereas those in age-groups of 30 and over take more than 20 months. The interval lengthens as the age of the bride rises from 30-44. At the age-group 45-49 there is some diminution in the period, due probably to the paucity of our data, or possibly to a physiological exaltation of fecundity prior to its extinction.

Hitherto we have dealt chiefly with the average periods and with short intervals between marriage and the birth of issue. Now there is a word or two to be said concerning those cases in which the average period is much exceeded, and in which the interval between marriage and the birth of issue is prolonged into years. Few of those wives who are destined to have children postpone for more than 5 years after marriage the accomplishment of their destiny. Seventy-five out of every 76 fruitful wives have a first child within 5 years of their wedding day, or, stated as a percentage, 98.7 per cent. of fruitful wives are fruitful

within 5 years of marriage. When the barren years of early matrimony lengthen out to ten, the probability of living issue is much less, only 1 in 426 fruitful wives pass through so long a period of probation and endeavour. The longest period between marriage and the birth of the first child which is disclosed in the 1855 registers is 19 to 20 years. There were two cases in which this prolonged period had occurred; both in the case of wives married during the quinquennium 20-24 years of age. A similar case is on record in New South Wales, where a period of 22 years elapsed between marriage and the birth of a first child. Another instance is recorded by Day, in which a wife married at 18 to a husband of 26 gave birth to her first and only child 29½ years after the date of the marriage. But these cases are eclipsed by an authentic instance which occurred in Scotland in 1861, in which a wife bore her first child in that year, though married in 1828; *i.e.*, after 33 years of married life. Unfortunately the age of the woman at marriage is not stated nor her age at the time of the birth. Another notable case occurred in 1855, notable on account of the mature age of the mother at marriage in combination with the period after marriage. It was that of a woman who was married between 35-39, and who had her first child more than 12 years later. These cases in which the period between marriage and first birth is prolonged occur for the most part among wives who are married under 25 years of age, but who differ in their fecundity from the mass of wives at these ages.

Of the 212 wives who in 1855 had a first child after

more than 5 years of married life, 46 were married at 15-19, 102 at 20-24, 35 at 25-29, 24 at 30-34, 5 at 35-39. Of the 38 wives who were barren for 10 years before primiparity, 10 were married at 15-19 years and 24 at 20-24 years. Unless, therefore, a woman who is sterile in the early years of marriage has

TABLE XL.—*Chronology of Births. The average Interval in Years between Marriage and Birth of successive Children.*

Order of Birth.	Age of Mother at Marriage.						
	Under 20.	20—24.	25—29.	30—34.	35—39.	40—44.	All Ages.
1	1.53	1.49	1.43	1.67	1.71	1.89	1.50
2	3.47	2.99	2.92	3.21	3.08	2.75	3.07
3	5.71	5.15	4.98	4.95	4.52	4.83	5.19
4	8.11	7.27	7.11	6.69	5.61	4.25	7.35
5	10.23	9.51	9.16	8.36	7.45	...	9.53
6	12.49	11.73	11.02	9.76	7.27	...	11.68
7	14.77	13.84	12.81	9.75	...	...	13.77
8	16.50	15.76	14.06	11.60	...	...	15.63
9	18.26	17.41	15.79	11.64	...	...	17.39
10	20.00	18.91	16.61	10.00	...	...	19.02
11	21.72	20.01	17.80	14.4	...	...	20.55
12	22.35	20.30	18.44	...	...	...	21.21
13	23.54	21.98	...	...	...	...	22.48
14	23.97	22.52	...	...	...	...	23.00
15	24.35	21.70	...	...	...	...	23.40
16	25.50	23.60	...	...	...	...	24.50
17	25.00	25.00	...	...	...	...	25.00

been married under the age of 25, her chance of becoming primarily fruitful in the later years of marriage is a small one.

(*b*) *The average interval between marriage and the birth of successive children.*—This is shown in Table XL., upon which some instructive comment may be made. There is disclosed the period in years during

which married life has continued at the time of the births in families of 1 to 17 children. Differentiation has been made according to the age of the mother at marriage, and the final column shows the figures applicable to all such ages combined. In the great mass of wives who are contributing to the population the period between the births of first and second children is somewhat longer than that between marriage and the birth of the first child. From the second to the seventh child the interval remains fairly constant at approximately 2 years. In families of greater numbers the interval between successive children after the seventh is often less than this. This does not mean that later-born children come more rapidly, but rather indicates in our opinion that the mothers of these large families have throughout their fertile life, even in respect to their earlier-born children, intervals shorter than the average. Comparison of the wives according to their age at marriage shows that wives married at 15-19, in regard to the birth of second and subsequent children, take on the average a longer period than wives married at any other age. In third and subsequent births the rule appears to prevail that the older the wife at marriage the shorter the average period between marriage and the attainment of any specified number of children. For example, the bride of 15-19 takes on the average 16.5 years to reach her eighth child, whereas in the case of the bride of 30-34 the period is only 11.6 years. The explanation of this feature of the table is doubtless this, that relatively fewer brides of 30-34 give birth to so many as 8

children, and those who do so are the mothers who conceive and bear rapidly.

(*c*) *The average number of children produced by persistently fertile mothers, according to the period since marriage.*—In presenting Table XLI. it is essential first to emphasise its exact purport. It does not show, as at first sight might be supposed, the average size

TABLE XLI.—*The average Number of Children produced by persistently Fertile Mothers, according to the period since Marriage.*

Period, in Years, since Marriage.	Age of Mother at Marriage.						
	Under 20.	20—24.	25—29.	30—34.	35—39.	40—44.	All Ages.
1—2	1.09	1.16	1.21	1.20	1.18	1.00	1.14
2—3	1.85	1.92	1.90	1.91	1.88	1.55	1.90
3—4	2.12	2.20	2.23	2.18	2.11	2.36	2.19
4—5	2.61	2.73	2.78	2.65	2.47	2.31	2.70
5—6	3.03	3.14	3.20	3.13	2.91	4.00	3.13
6—7	3.45	3.60	3.66	3.55	3.40	3.67	3.58
7—8	3.86	4.02	4.07	4.00	4.00	5.00	4.00
8—9	4.30	4.44	4.45	4.30	4.42	3.50	4.41
9—10	4.70	4.86	4.93	4.65	4.61	4.50	4.83

of all families at stated periods after marriage. It deals only with those families in which a birth occurred in the final year of the period in question. For instance, in the last column of the table opposite the period 7 to 8 years the average number of children is stated as 4. This means that those wives who had a child 7 to 8 years after marriage had borne on the average 3 previous children.

The table distinguishes wives married at different ages, and covers a period of 1 to 10 years after marriage.

The figures relative to wives of all ages taken together show a remarkable regularity in the later years included in the table. From the fourth year onwards the increase slightly exceeds .4 per annum. Differentiating according to the ages at marriage, the figures relating to wives married at 40-44 years of age are very irregular. This might be anticipated, in view of the small number of women entering on marriage at these advanced ages and proving fruitful over so extended a period of years. No great weight, therefore, can be attached to the figures appearing in this column. The remainder of the table indicates that of those mothers who give birth to a child at any period from 1 to 10 years after marriage, those who were married at the ages of 20-29 have had a larger average number of previous issue than those married at any other ages. Wives married at 25-29, who continue fertile, show slightly larger families than those married at 20-24. No correction has been made for antenuptial conceptions, which doubtless increase to some extent the figures throughout the table. Their influence is likely to be more pronounced in the early years.

(*d*) *The distribution of births, according to the order of birth and the duration of marriage.*—The incidence of the births of different orders, in relation to the period which has elapsed since marriage, may be more closely studied by an inspection of Table XLII. In this table is set forth the percentage of the births of each order which occurred in individual years of matrimony. The occurrence of a certain number of

TABLE XLII.—*Percentage Distribution of Birth*

Duration of Marriage in years.	First Births.	Second Births.	Third Births.	Fourth Births.	Fifth Births.	Sixth Births.	Seventh Births.	Eighth Births.
0	22.02	1.37	.50	.20	.11	.10	.11	.10
1	61.30	6.23	.75	.25	.14	.04	.17	.03
2	11.12	29.35	2.46	.40	.09	.08	.11	.10
3	2.82	37.56	9.05	1.29	.32	.18	.15	.10
4	1.13	14.82	25.00	3.90	.58	.12	.11	.05
5	.55	5.08	29.23	11.12	1.69	.37	.17	.08
6	.42	2.24	17.23	21.40	5.27	1.04	.41	.26
7	.18	1.15	6.87	22.05	9.95	1.95	.47	.33
8	.11	.60	3.19	16.30	15.13	5.00	.98	.33
9	.07	.42	1.99	9.38	20.00	9.58	2.60	.67
10	.06	.22	1.24	5.64	18.86	14.78	5.83	1.47
11	.07	.22	.72	3.15	11.82	19.31	9.39	3.64
12	.04	.23	.50	1.36	6.47	15.38	12.00	5.39
13	.02	.22	.31	.91	3.37	11.58	15.20	8.69
14	.01	.12	.38	.81	2.03	7.06	15.44	13.28
15	.02	.05	.23	.54	1.66	5.18	13.01	14.81
16	.02	.07	.14	.32	.82	2.84	7.84	14.11
17	.01	.04	.03	.38	.57	1.98	5.79	11.48
18	.01	...	.06	.25	.53	1.07	3.62	9.65
19	.01	.01	.04	.11	.20	.74	2.73	6.09
20	.01	...	.01	.10	.20	.51	1.53	4.38
21	...	...	.01	.04	.03	.42	.79	1.93
22	...	...	.02	.04	.07	.30	.49	1.39
23	...	...	.01	.04	.03	.20	.60	.80
24	...	...	.01	.01	.02	.07	.15	.26
25	...	...	.01	...	.02	.06	.11	.26
26	...	...	...	.01	...	.03	.08	.13
27	...	...	...	...	...	...	...	.08
28	...	...	...	...	...	.03	.08	...
29	...	...	...	...	...	...	.02	.03
30	...	...	...	...	.01	...	.02	...
31	...	...	.01	...	...	...	...	.08
32	...	...	...	...	...	...	...	...
33	...	...	...	...	.01	...	...	...
34	...	...	...	...	...	...	...	...
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

:ording to Duration of Marriage.

Ninth Births.	Tenth Births.	Eleventh Births.	Twelfth Births.	Thirteenth Births.	Fourteenth Births.	Fifteenth Births.	Sixteenth Births.	Seventeenth Births.
.19	.13	...	...	...	...	...	...	...
.04	.06	...	.23	...	...	...	...	...
...	...	...	...	...	...	...	...	...
.08	...	...	...	...	...	...	...	...
.04	...	...	...	...	...	...	...	...
.04	...	...	...	.56	...	...	...	...
.31	.26	.11	.23	...	1.47	...	...	...
.19	.06	...	...	.56	...	...	...	...
.15	.06	.11	.23	...	...	...	...	...
.38	.19	.11	...	...	...	...	...	...
.38	.45	.11	...	...	...	...	...	...
.61	.51	.22	.47	...	...	...	...	...
1.91	.51	.45	.70	...	...	...	...	...
3.98	1.03	.89	.47	.56	...	...	...	...
6.43	2.83	1.34	.70	...	...	...	...	...
10.37	5.79	2.12	1.17	2.78	...	2.70	...	...
12.36	7.46	4.36	2.11	1.11	1.47	2.70	...	...
14.27	9.52	5.36	5.40	1.66	1.47	...	11.11	...
13.27	12.62	7.15	5.87	1.66	2.94	2.70	...	...
11.78	14.35	10.62	8.70	6.67	4.41	2.70	...	...
9.07	12.74	15.09	10.10	7.22	7.35	...	11.11	...
5.62	11.06	14.30	13.86	9.44	10.30	13.51	...	...
4.28	8.42	13.07	15.26	14.45	10.30	16.22	11.11	...
1.76	5.14	9.61	11.28	13.33	19.12	18.93	...	33.33
1.26	3.54	6.37	8.45	13.33	4.41	...	...	...
.58	1.54	3.13	7.04	9.44	16.18	13.51	11.11	16.67
.27	.90	2.46	4.46	8.89	7.35	16.22	22.22	33.33
.11	.13	1.12	1.64	2.22	5.88	...	...	16.67
.11	.26	.78	.70	3.89	...	5.41	33.34	...
...	.06	.56	.23	1.11	5.88	...	...	...
.08	.19	.56	.23	.56	1.47	...	...	...
.04	...	...	.47	...	...	2.70	...	...
.04	...	...	...	.56	...	2.70	...	...
...	.06	...	...	...	...	...	...	...
...	.13	...	...	...	...	...	...	...
100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

births, denoted as belonging to the later orders, within the year of marriage or the immediately succeeding years is accounted for by the earlier births in the same family having taken place prior to the marriage ceremony. The figures relating to these cases may be disregarded. It will be noted that the year of married life at which in each order the largest number of births occurs corresponds very closely to the average period already stated for each order in Table XL. (p. 100). Thus in the first ten orders of birth respectively the highest percentages are found 1, 3, 5, 7, 9, 11, 14, 15, 17, and 19 years after marriage. Eleventh births are most numerous 20 years after marriage, and twelfth to fifteenth births chiefly occur 22 to 23 years after marriage. The table also indicates that very few second births are postponed more than 5 years after marriage, and, similarly, that the large majority of third births occur in less than 8 years after marriage. In subsequent orders of birth the numbers are more evenly distributed.

The registers disclosed several interesting particulars which are not shown in the table, but which were carefully noted as correctly transcribed. For the accuracy of the facts represented it is not possible to vouch at this late date, and in the impossibility of special inquiry into each case. Among these anomalous entries was one in which a second child was born, after 24 years of married life, to a mother who had been married when aged 20-24; and another, in which a mother married at 30-34 had her second child

after 22 years. In the case of a third birth, 31 years had passed since marriage; and in another instance a period of 33 years had culminated in the birth of a fifth child to a mother married under 20. Periods of prolonged fecundity stretching from 28-32 years occurred in connection with sixth, seventh, eighth, and ninth births. There were two cases of tenth births after 34 years of matrimony, in one of which the mother was married under 20, and in the other at an age between 20 and 24.

(*e*) *The occurrence of multiple births in relation to the duration of marriage.*

Triplets.—The duration of marriage in each of the 10 triplet cases is shown in Table XXIV. (p. 61).

In one case the period was only 4 years, there having been two previous births in the family. On the average, however, nearly 12 years had passed since marriage, and in one case the period had lengthened out to 20 years.

Twins.—Table XLIII. shows the order of birth and the year of marriage in the case of twins born in 1855. From it we notice that the greatest number are first births. The next most numerous groups are the third and fourth births, which are nearly equal in number. These are followed by two groups, approximately equal to each other, the second and fifth births. In each of the later orders of birth the number of twins regularly decreases. With regard to the duration of married life and the occurrence of twin births, the highest number occurs after 1 year of married life. From the second to the twelfth year the numbers do

not show great variation, but are somewhat irregular, and do not appear to depend to any extent upon the

TABLE XLIII.—*Distribution of Twin-Births according to* (1) *Order of Birth, and* (2) *Duration of Marriage.*

Order of Birth.	Number of Twin-Births.	Years elapsed since Marriage.	Number of Twin-Births.
1	152	0	37
2	111	1	102
3	134	2	52
4	138	3	51
5	108	4	60
6	95	5	53
7	76	6	68
8	64	7	56
9	57	8	56
10	20	9	49
11	11	10	43
12	5	11	52
13	1	12	41
14	0	13	40
15	0	14	40
16	1	15	38
Not stated	3	16	35
...	...	17	30
...	...	18	12
...	...	19	17
...	...	20	14
...	...	21	11
...	...	22	2
...	...	23	2
...	...	24	4
...	...	25	0
...	...	26	0
...	...	27	0
...	...	28	1
...	...	29	1
...	...	Not stated	9
Total .	976	Total .	976

duration of married life. After 12 years of married life the number of twins tends to decrease up to the

period of 29 years, which is the longest period shown in the experience of 1855.

The analysis of the registered particulars concerning twin births disclosed interesting details. Nearly all the first-birth twins were born within 2 years of marriage, but in one instance so long a period as 16 years was followed by such a twin birth. The average interval between marriage and the birth of first-birth twins is 1.40 years; second-birth twins nearly all occur within 4 years of marriage. An exceptional case occurred after 16 years, and the average period is 3.25 years. Third-birth twins chiefly occur from 4 to 6 years after marriage, though in one instance 15 years elapsed. Their average period is 5.37 years. The average period between marriage and the birth of fourth-birth twins is 7.45 years. Most of these births take place 6 to 7 years after marriage, though such births occur up to 16 years after marriage. Fifth-birth twins generally occur from 8 to 11 years after marriage, though in one case as much as 21 years and in another as much as 20 years was the interval. Their average period is 9.68 years.

Twins born later in order than fifth births show average periods of 12.14, 14.13, 14.65, 16.2, 18.5, 20.3, 19.8 years for the sixth up to the twelfth births respectively. One thirteenth birth occurred 28 years after marriage, and one sixteenth birth as early as 17 years after marriage. This means that one mother had 17 children after as many years of married life. Twins born 29 years after marriage occurred in one case as an eleventh birth.

CHAPTER XIII

MASCULINITY

THE term masculinity is a convenient one, in that it expresses in one word the proportion of the sexes at birth. It is usual for birth statistics to show a preponderance of male births, hence the selection of the term masculinity. The proportion of masculine and feminine births must be the result of definite causes, and dependent on laws which are not yet adequately known. If it is not possible for us to state these laws, it is at all events within our ability to discuss masculinity as observed under various conditions. We propose to discuss the statistical expression of the fact, and to set forth such light as our data may throw on its occurrence.

Expression of masculinity.—Masculinity is expressed in general as the number of male births per 100 or per 1000 female births. The difference is of minor importance since the figures are the same, but the latter method has the advantage of having no decimal points, and in this section we shall adhere to it. In general, the male births exceed the female births: the masculinity is then termed positive, and

its representative figure is above 1000. In the event of there being fewer male births than female births, the masculinity is termed negative, and its representative figure is then below 1000. If the sexes are equally divided, masculinity is neither positive nor negative, and is represented by the figure 1000.

Under present conditions the possession of a positive masculinity appears to be an integral necessity of a vigorous nationality. The reason for this lies in the heavier mortality which the male suffers as compared with the female in the early years of life. Male children perish not only in early years, but even in early months, at a greater rate than their sisters. The result of this higher death-rate is to neutralise positive masculinity and to equalise the distribution of the sexes. Aided by emigration, it may even produce a sex distribution of the population which entirely reverses the proportion which the sexes held at birth, the result being an excess of females in the adult population. This result is more probable if the masculinity is only feebly positive. A negative masculinity is quite exceptional among civilised nations.

Magnitude of masculinity.—The magnitude of masculinity varies within certain defined limits. The masculinity of a people rarely exceeds 1100, or falls below 900. Therefore we may say broadly that a 10 per cent. variation in either direction covers the range of masculinity in aggregate populations. We shall see that when smaller groups are considered the range of masculinity is beyond this limit, but at present we are dealing with it only in broad outline.

Further, this 10 per cent. variation includes exceptional conditions both of positive and of negative masculinity. The common range of masculinity is much less than this. Its representative figures are usually between 1020 and 1070. Its variation, therefore, does not usually exceed 5 per cent.

Variations of masculinity.—Considerable variations of masculinity are observed when diverse conditions of existence are investigated. These conditions may conveniently be discussed under the following headings: (1) Nationality, (2) Birth-rate, (3) Legitimacy and Illegitimacy, (4) Stillbirth, (5) Primogeniture, (6) Order of Birth, (7) Multiple Births, (8) Urban or Rural Residence, (9) Social Condition, (10) Season of the Year, (11) National Calamities, (12) Parental Age.

(1) *Nationality.*—The magnitude of masculinity varies greatly in different nations. Amongst European countries Greece and Roumania take the leading places, their average masculinity for the years 1865 to 1890 being 1138 and 1108 respectively. Though scattered in different countries, it has frequently been observed that the Jewish race show an exceptionally high masculinity. The Latin races, with the exception of France—that is to say, Italy, Portugal, and Spain—all show high masculinity. Russia, Germany, and the United Kingdom represent a medium masculinity, while that of France is lower than in any of the preceding nations. A negative masculinity is said to occur among certain uncivilised races.

Masculinity does not always maintain the same

level. Its movement may be either in the direction of increase or of diminution. Such variations may occur in nations with either high or low masculinity. Thus while Greece and Roumania both show a high present masculinity, in the former the variation is in the direction of increase, while in the latter there has been a tendency to diminution. Other nations which show an increasing masculinity are Spain and Norway, while Russia, Austria, and Italy maintain a stationary position. A decrease in masculinity is a prominent feature in the statistics of Great Britain, France, and Belgium.

TABLE XLIV.—*Masculinity. Nationality and Birth-rate.*

Period.	England and Wales.		Scotland.		France.	
	Birth-rate.	Masculinity.	Birth-rate.	Masculinity.	Birth-rate.	Masculinity.
1811—1820	...	...	...	...	31.8	1064
1821—1830	...	...	...	...	30.9	1060
1831—1840	...	...	...	...	29.0	1060
1841—1850	32.6	1049	...	...	27.4	1056
1851—1860	34.1	1046	34.1*	1057*	26.7	1056
1861—1870	35.2	1042	34.9	1054	26.2	1049
1871—1880	35.4	1038	34.8	1056	25.4	1047
1881—1890	32.5	1037	32.3	1054	23.9	1046
1891—1900	29.9	1036	30.2	1050	22.2	1041

* Six years only.

Table XLIV. shows the average masculinity in England and Scotland separately for each decade since the registration of births began, and also for comparison the corresponding figures relating to France from 1811-1900. It will be observed that in all three countries the masculinity has steadily decreased from the commencement, with the exception

of a slight temporary reaction in the case of Scotland in the decade 1871-80. This irregularity is attributable to an abnormally high masculinity in 1871 and 1872. In the case of England, the figures show a decrease in six decades from 1049 to 1036, while in the case of France, during a period of nine decades there is a decrease from 1064 to 1041. It is notable that in each decade the lowest masculinity is that of England; and this is approximately as much below that of France as the latter is below that of Scotland. The mean masculinity of Scotland for the 47 years 1855-1901 was 1053, a moderate but not very high figure. The maximum in this period was 1070, attained in the year 1871, and the minimum was 1042, in the year 1861.

In connection with the influence of race on masculinity, it is essential to inquire whether cross-breeding is associated with a high or a low masculinity, or has any marked effect in increasing or diminishing its magnitude. The researches of Monsieur S. Gache throw some light on this question, at all events as it is observed in Buenos Ayres. Cross-breeding has in this town invariably had the effect of raising the masculinity. The births as the result of unions of Italians, Spanish, and French male emigrants with the Argentine female natives show a higher masculinity than the births produced either by pure Argentine alliances or by pure alliances of any of these nations in Buenos Ayres. The figures on which this statement is founded cover a period of ten years from 1884 to 1893. Further, the unions of

Argentine males with females of foreign nationality provide a higher masculinity than is common among Argentines themselves.

Although perhaps we would hardly expect emigration to affect masculinity among the emigrants in so marked a degree as to be capable of demonstration in figures, there is some evidence to this effect.

In forming any conclusion on this point it is necessary to eliminate carefully the influence of cross-breeding. This increases masculinity, whilst emigration appears to have the opposite effect. It is necessary, therefore, to be careful that the one influence does not obscure the other. For this purpose the only statistics that are reliable must refer solely to marriages of persons of one nationality, but resident in another country. Fulfilling these conditions are the figures as to the natality and masculinity in Buenos Ayres during the years 1884-93. It appears that the Italian, Spanish, and French nationalities furnish a large proportion of the emigrants in Buenos Ayres, more especially the Italian. The English population is small, and provides too small a proportion of the whole births to be quoted as to masculinity. The Italians married to Italians, but resident in Buenos Ayres, have a lower masculinity than Italians in their home country. Whereas in Italy the masculinity is 1060, in Buenos Ayres Italians have only a masculinity of 1042. Spaniards married to Spaniards, but resident in Buenos Ayres, have a masculinity of 1028, whereas in Spain the masculinity is 1083. French married

to French, but resident in Buenos Ayres, show a masculinity of 1036; somewhat less than the masculinity of France, which for the same period was about 1046. These three Latin races appear to lose somewhat in masculinity by emigration. This rule does not invariably apply to the Anglo-Saxon race. The general masculinity of the British Colonies is quite as high as that of the home country. Canada, Australia, and New Zealand all possess a masculinity of 1050 or upwards.

(2) *Birth-rate.*—What influence has the birth-rate on masculinity? Does the rise and fall of masculinity vary directly or inversely with the birth-rate, or does it appear that the latter has no influence on masculinity? For the discussion of this question we are enabled to draw upon a complete series of figures for Scotland, England, and France. The birth-rate is stated per thousand of the whole population living at all ages. The relative figures are found in Table XLIV. (p. 113), which shows that in all three countries the fall in both masculinity and the birth-rate is very great. In the case of France in particular, the regularity of the fall during so extended a period of years is very striking. The English birth-rate, however, reached a high level between 1860 and 1880, and since the latter date its decline has been very pronounced. On the other hand, the masculinity has progressively decreased throughout the sixty years. In Scotland as in England, the birth-rate attained its highest point between 1860 and 1880, and has since declined. The masculinity of Scotland has notably

diminished, but not with that regularity which characterises the French figures. In Ireland during thirty years, the masculinity has fallen from 1058 to 1056, while the birth-rate declined from 26 to 23.

It is evident, therefore, that a falling birth-rate may be accompanied by a falling masculinity. The English figures show, however, that a rise in the birth-rate does not necessarily involve a rise in the masculinity. In further confirmation of the fact that the birth-rate and the masculinity may vary in different directions during the same period, it is sufficient to quote the experience of Buenos Ayres during the decade 1884-93. In the first five years its birth-rate was 35.97 and its masculinity 1051.6, while in the second five years the birth-rate rose to 43.29 and the masculinity fell to 1033.5. We are therefore justified in concluding that variations in masculinity may be coincident with, but do not depend upon similar variations in, the birth-rate.

(3) *Legitimacy and illegitimacy.*—Masculinity is seldom of the same magnitude in the legitimate and illegitimate births. It is, however, generally positive in both classes, but in some countries the legitimate and in others the illegitimate births show the higher masculinity. In the continental countries of Europe the illegitimate births almost invariably exhibit a much lower masculinity than the legitimate births. Various explanations have from time to time been suggested to account for this: *e.g.*, (1) the probability of a large number of illegitimate births being concealed; (2) the non-registration of stillbirths, and the likelihood of a larger proportion of illegitimate males being

stillborn than in the case of the legitimate males; and (3) the more youthful age of the fathers of illegitimate children as contrasted with that of the fathers of legitimate offspring. We are not here concerned with the validity of these explanations, but merely with the figures recorded. A comparison of the masculinity in legitimate and illegitimate births in France in each decade from 1811 to 1900 is shown in Table XLV.,

TABLE XLV.—*Mean Masculinity.*

Period.	France.		Belgium.	
	Legitimate Births.	Illegitimate Births.	Legitimate Births.	Illegitimate Births.
1811—1820	1068	1044	...	...
1821—1830	1064	1041	...	...
1831—1840	1064	1039	...	...
1841—1850	1058	1032	1055	1025
1851—1860	1059	1036	1054	1025
1861—1870	1050	1034	1054	1030
1871—1880	1049	1028	1049	1024
1881—1890	1047	1034	...	...
1891—1900	1043	1031	...	...
Average .	1055	1035	...	...

from which it will be seen that the difference in masculinity is both considerable and consistent. It may be noted also that the illegitimate masculinity shows the same feature of a steady and large decline which characterises the legitimate births, and which has been already referred to in the case of the total births shown in Table XLIV. (p. 113). Table XLV. also shows similar figures relating to Belgium during a period of four decades. Here also the legitimate masculinity is the greater. Düsing gives the legitimate

masculinity of Prussia in the years 1875-87 as 1064, whilst the illegitimate masculinity for the same period was only 1055. In Great Britain the masculinity of the illegitimate births appears to follow a reverse rule to that on the Continent. Both in England and Scotland the illegitimate births show consistently a masculinity exceeding that of the legitimates. In Table XLVI. is collected the masculinity of the

TABLE XLVI.—*United Kingdom. Mean Masculinity.*

Period.	England and Wales.		Scotland.		Ireland.	
	Legitimate.	Illegitimate.	Legitimate.	Illegitimate.	Legitimate.	Illegitimate.
1852—1861	1046	1048	1052*	1073*	...	...
1862—1871	1041	1046	1056	1062	1056†	1043†
1872—1881	1038	1040	1054	1058	1058	1062
1882—1891	1037	1043	1054	1059	1057	1047
1892—1901	1036	1044	1049	1055	1056	1051
Average .	1039	1044	1053	1061	1057	1051

* 1855-1861. † 1864-1871.

legitimate and illegitimate births in each of the countries composing the United Kingdom. The figures given are those of the mean masculinity for each decade, and cover the period since registration commenced in Scotland and Ireland, and the years 1852-1901 for England and Wales. It is noticeable that whereas in Scotland after the first seven years the difference between the legitimate and illegitimate masculinity remains virtually constant, in England this has somewhat increased, and in the last decade amounted to eight. The figures for Ireland show considerable fluctuations, but it must be borne in mind that the

illegitimate births are very few, and they therefore hardly form a basis sufficiently secure for argument. The experience of New South Wales appears to coincide with that of the Continent of Europe. Its masculinity is stated by Coghlan as 1058.5 in the case of legitimate, and 1034.1 in the case of illegitimate births (1882 to 1901).

In Scotland the masculinity during a period of 47 years (1855-1901) has varied in individual years from 1067 to 1037 in the legitimate births, and from 1103 to 1002 in the illegitimate births. The mean legitimate masculinity is 1053, whilst that of the illegitimate births is 1061. The difference between French and Scottish masculinity may be explained by the radical difference between the illegitimacy of the two countries. In Scotland a large proportion of the illegitimate births are the product of conditions akin to ordinary marriage, and are indeed rendered legitimate by subsequent marriage of the parents. It is frequently the custom in Scotland to postpone marriage until the birth of one child, which is registered at first as illegitimate. It is therefore reasonable to expect that in Scotland the illegitimate births should correspond more closely to the legitimate births in masculinity than is the case in France and other countries. In France, the difference between the mean masculinity of legitimate and illegitimate births is 20 over a period of 90 years, whereas in Scotland the same difference over a period of 47 years amounts to only 8. Table XLVI. shows that the same difference in the case of England and Wales only

amounts to 5 in the mean masculinity of 50 years. Ireland corresponds more closely with France in that the mean legitimate masculinity exceeds the illegitimate figure, but the difference is not nearly so high as in the latter country.

(4) *Stillbirths.*—It is worth noting that the excess of male births is really appreciably greater than is apparent from the birth registers. The reason is that in the United Kingdom no registration is made of stillbirths, among which the proportion of males is very high. In illustration of this phase of masculinity, we give in Table XLVII. figures showing for a variety of places and for different periods the masculinity of stillbirths. The table includes for several of the places and for comparative purposes the masculinity among live births, which is commonly about 1050. The masculinity of stillbirths is never lower than 1200, and rises in one instance to 1700, though it is generally about 1300. As stillbirths seem to average about 40 to 1000 living births, it appears that a masculinity of 1050 among living births represents a masculinity of 1060 or more amongst viable births. Rosenfeld shows that in Vienna in the years 1895 and 1896 the inclusion of the stillbirths raises the masculinity from 1061 to 1070. Corbaux presents figures relating to Paris, and covering a period of eight years, which show a similar increase from 1039 to 1047. In Sweden the analogous figures as quoted by Wargentin are 1037 and 1044.

(5) *Primogeniture.*—It may naturally be expected

that on such a subject as masculinity some light may be thrown by a consideration of its phenomena as they occur in first births. Here there are no precedent

TABLE XLVII.—*Masculinity of Stillbirths.*

Place.	Observer.	Period.	Masculinity of Stillbirths.	Masculinity of Live Births.
Amsterdam . .	Quetelet	1821—1832	1312	1057
Paris . . .	„	1823—1832	1226	1040
Dublin . . .	Clarke	...	1701	1101
Westminster . .	Bland	...	1400	1008
Sweden and Finland	...	1755—1763	1356	1044
Alsace-Lorraine .	Stieda	1872—1873	1279	1059
Italy . . .	Bodio	1887—1891	1311	1058
France . . .	„	1887—1891	1422	1046
Germany . . .	„	1887—1891	1283	1052
Austria . . .	„	1887—1891	1321	1058
Hungary . . .	„	1887—1891	1300	1050
Switzerland . .	„	1887—1891	1350	1045
Belgium . . .	„	1887—1891	1321	1045
Netherlands . .	„	1887—1891	1277	1055
Prussia . . .	Düsing	1872—1881	1291	1054
Paris . . .	Corbaux	(8 years)	1202	1039
Montpellier . .	Mourgue	...	1286	1065
Sweden . . .	Wargentin	...	1348	1037
Norway . . .	Ploss	1865—1882	1291	...
Spain . . .	„	1865—1870	1503	...
European Russia .	„	1875—1878	1282	...
Massachusetts . .	„	1870—1881	1481	...
Rhode Island . .	„	1875—1883	1595	...
Livonia . . .	Carlberg	1873—1882	1269	1053

procreations to alter the succeeding births, either by influencing the fecundity of the parents, or by introducing modifications of probability as to the sex of the issue. Accordingly it is to the first births that we look for a clue to some at least of the causes that influence sex and modify masculinity. It is a common belief that the masculinity of first-born children exceeds that of later-born children. This means that on the whole there is a greater probability

of a first birth being a boy than of subsequent births proving male. We find that in Scotland in 1855 the masculinity of the legitimate first births was 1054, whereas the masculinity of the total legitimate births was 1049. There is thus an excess of masculinity of 5 in favour of the legitimate first births as compared with the total legitimate births. If we compare the former, not with the total births but with subsequent births, this excess is raised to 6, the masculinity among the latter being 1048. This is a feature which is not constant at all ages of the parents, but prevails in the case of fathers up to the age of 49. From the age of 50 onwards the masculinity of first births, is lower than that of the total births at these ages. With regard to mothers, the first births exceed the total births in masculinity at the early ages, but after the age of 25 years the proportion of males among the first births is lower than that in the total births. The actual figures are as follows :—

Masculinity.

Age.	Fathers.		Mothers.	
	Total Births.	First Births.	Total Births.	First Births.
15—19	1150	1203	996	1017
20—24	1019	1037	1038	1073
25—29	1027	1032	1046	1039
30—34	1077	1105	1066	1048
35—39	1066	1112	1041	1039
40—44	1033	1084	1065	1000
45—49	1049	1136	...	...
50—54	1045	852	...	...
55—59	1165	889	...	...
60—64	940	765	...	...

The general bias of masculinity among the first births is brought out very strongly in Austrian figures, dealing with 1,140,860 living births and submitted by Bertillon. The masculinity of the first and subsequent births was respectively 1086 and 1054. The same feature was noticed by Bowser in his investigations into the families of Baptist ministers. Out of 1653 children 314 were first births, and these exhibited a masculinity of 1220 in contrast to a masculinity of 1008 among the subsequent births. The same result appears conspicuously in the figures given by Day with regard to the issue of second marriages in the British Peerage. There was a majority of female births as a whole, but the first births of 307 fruitful marriages exhibited a masculinity so high as 1302. In both of these latter investigations, however, the number of births under observation was small. In an inquiry by Stieda into the births in Alsace-Lorraine in 1872-73, although the numbers dealt with were large, the first births were not found to display quite so high a masculinity as the subsequent births. It appears, therefore, that the rule as to a higher masculinity in first births is not invariable. Table XLVIII. presents these results for comparison.

(6) *Order of birth.*—The masculinity of the first births has just been described, and contrasted with subsequent births as a whole. So far as Scotland is concerned, it is possible for us to differentiate between the subsequent births and to assign a masculinity to each individual order of birth for the year 1855.

TABLE XLVIII.—*Masculinity and Primogeniture.*

Source.	Observer.	Period.	Total Births.	Masculinity.	
				First Births.	Subsequent Births.
British Peerage (Second Marriages)	Day	1856—1864	1,046	1,302	849
Ministers' Families	Bowser	1871	1,653	1,220	1,008
Austria	Bertillon	...	1,140,680	1,086	1,054
Alsace-Lorraine	Stieda	1871—1873	47,198	1,058	1,059
Saxony	Geissler	1876—1885	4,794,304	1,054	(1,000)
Scotland	Lewis	1855	85,964	1,054	1,048
Denmark, Norway, and Austria	Bertillon	...	...	1,100	1,050

This is done in Table XLIX. for all births up to the twelfth, and it is found that the results are extremely irregular. No doubt, this is due to the limitation of the data both as to time and numbers. The second and third births present low masculinities, whereas

TABLE XLIX.—*Masculinity and Order of Birth. Scotland* 1855.

Order of Birth.	Masculinity.	Order of Birth.	Masculinity.
1	1054	7	1058
2	1036	8	1073
3	1005	9	1085
4	1071	10	1102
5	1078	11	947
6	1047	12	1005

the fourth and fifth births are substantially above the average. There is a fall in the masculinity of the sixth births, but thereafter up to the tenth births the masculinity rises. Later, the births are in numbers too small for reliable proportion in their masculinities.

It is interesting to note that Geissler, assorting the families of Saxony in the years 1876-85, found that the masculinity of marriages with 2 to 7 children was 1058, while that of marriages having over 7 children was 1068.

(7) *Multiple births.*—The sex distribution of the 10 legitimate triplets born in Scotland in 1855 has been fully given on p. 61 and in Table XXIV. (p. 61). Their masculinity was high, probably indeed abnormally so, as it reached 1308. (If we include the one illegitimate triplet, the masculinity rises to 1538.) The masculinity of triplets is, however, often high, for an investigation including France, Germany, and Austria gave a masculinity of 1080. Düsing gives the masculinity of triplets in Prussia in the years 1824-87 as 1051. On the other hand, Carlberg found that in Livonia triplets showed a masculinity of only 781. The 1050 cases of twin births which occurred in Scotland in 1855 comprised 321 cases of two males, 320 cases of two females, and 409 cases in which the sexes were diverse. It is remarkable that the first two of these numbers should be so nearly identical. The sex distribution of the 976 legitimate twins gives a masculinity of 1002, there having been 977 males to 975 females. The inclusion of the 74 illegitimate twins does not alter this masculinity, as they were equally divided as to sex.

The sex distribution of the twin births in Paris during the 4 years 1892-95 showed that their masculinity was negative when the mother was under

the age of 25 years, and positive when she was over that age. In France, as a whole, it is stated that the masculinity of twin births is only 1020, while in Prussia it is 1056, and in Saxony 1078. Occasionally, a high masculinity may be associated with twin births, as noted by Carlberg in Livonia, where the masculinity of twin births is 1066, and slightly exceeds the masculinity of the total births.

(8) *Urban and rural residence.* — Masculinity varies very decidedly under urban and rural conditions. Attention has been drawn to this circumstance by continental statisticians, and the figures given in the Scottish reports enable us to ascertain whether the same variation exists in Scotland. Considering first the total births, we find that there is in rural districts a higher masculinity than in towns. At first, *i.e.*, from 1855 to 1870, Scotland was divided into Town Districts, Mainland Rural Districts, and Insular Rural Districts. In 1871 the Town Districts were further subdivided into Principal Towns, Large Towns, and Small Towns, and the figures were no longer given in one group for all towns. We therefore submit the figures for the different groups of Town Districts from 1872-1901, and for Rural Districts from 1855-1901. We should premise that the size of a principal town is a town with a population of over 25,000, of a large town from 10,000-25,000, and of a small town from 2000-10,000 persons. In 1901 the population required to confer the dignity of a principal town was raised to 30,000.

Table L. shows the mean masculinity of the total births in Scotland, according to the urban or rural character of the districts in which the births occurred.

It is clear from this table that in towns with populations higher than 10,000 the masculinity is lower than in rural districts. Further, the island population shows a higher masculinity than the

TABLE L.—*Masculinity. Urban and Rural Residence. Scotland. Total Births.*

Period.	Principal Towns.	Large Towns.	Small Towns.	Mainland Rural Districts.	Insular Rural Districts.
1855—1861	...	...	...	1056	1066
1862—1871	...	...	...	1059	1056
1872—1881	1050	1056	1061	1053	1080
1882—1891	1051	1056	1055	1055	1087
1892—1901	1047	1046	1049	1052	1071
Average .	1049	1053	1055	1055	1072

mainland rural districts, and there is little difference between the smaller towns and the country districts. The latter feature is quite consistent in view of the small population required to rank a place as a town. As Scotland possesses few really large towns, the comparison must be mainly between these and the rest of the country. The conclusion is undoubtedly in favour of rural life as a stimulus to masculinity in the population as a whole. Our statistics do not enable us to explain the manner in which the influence of rural life is exercised upon individual births. To

show that the variation in masculinity in town and country is not influenced by legitimacy and illegitimacy, we give similar tables (LI. and LII.) for legitimate and illegitimate births separately.

TABLE LI.—*Masculinity. Urban and Rural Residence. Scotland. Legitimate Births.*

Period.	Principal Towns.	Large Towns.	Small Towns.	Mainland Rural Districts.	Insular Rural Districts.
1855—1861	...	...	...	1054	1064
1862—1871	...	...	...	1058	1055
1872—1881	1049	1056	1058	1054	1083
1882—1891	1051	1056	1054	1055	1085
1892—1901	1048	1044	1050	1052	1062
Average .	1049	1052	1054	1055	1070

TABLE LII. *Masculinity. Urban and Rural Residence. Scotland. Illegitimate Births.*

Period.	Principal Towns.	Large Towns.	Small Towns.	Mainland Rural Districts.	Insular Rural Districts.
1855—1861	...	...	...	1081	1101
1862—1871	...	...	...	1074	1072
1872—1881	1056	1058	1073	1047	1049
1882—1891	1054	1060	1075	1055	1140
1892—1901	1045	1085	1047	1061	1126
Average .	1052	1068	1065	1064	1098

The legitimate births show very much the same incidence of masculinity as the total births. The insular districts exhibit the highest masculinity and the principal towns the lowest masculinity.

In the illegitimate births the numbers dealt with

are smaller and more erratic, but the main fact that masculinity is higher in rural districts than in towns is plain, whether the births be lawful or not.

A similar experience is manifest in France, as shown by Maurel, and reproduced in Table LIII. The masculinity in rural districts is higher than in towns or in the Department of the Seine. In these

TABLE LIII.—*Masculinity. Urban and Rural Residence. France. Total Births.*

Period.	Seine Department.	Towns.	Rural Districts.
1853—1860	1039	1046	1056
1861—1870	1033	1041	1050
1871—1880	1033	1039	1047
1881—1890	1028	1038	1054
1891—1900	1038	1037	1046
Average .	1034	1040	1050

figures the legitimate and illegitimate births are taken together, and stillbirths are excluded. The figures are therefore entirely comparable with those for the total births of Scotland (Table L.). An even more complete parallel in Prussia is found in the following table given by Düsing, and covering a period of 13 years. The districts are divided in a very similar manner to those of Scotland.

TABLE LIV.—*Masculinity. Urban and Rural Residence. Prussia. Total Births.*

Period.	Berlin.	Large Towns.	Middle Towns.	Small Towns.	Rural Districts.
1875—1887	1052	1053	1056	1062	1066

In other countries broader divisions are commonly made, all towns being included in one group and compared with rural districts. The following figures indicate that the same feature of a higher masculinity in rural districts is found in several civilised countries.

TABLE LV.—*Masculinity. Urban and Rural Residence. Total Births.*

Place.	Period.	Masculinity.	
		Urban.	Rural.
Belgium . .	1815—1824	1067	1070
Belgium . .	1825—1829	1053	1061
Massachusetts.	1849	1047	1114
Sweden . .	1861—1870	1046	1052
Sweden . .	1871—1875	1042	1055
Norway . .	1851—1870	1045	1060

In rare instances, the masculinity of towns may exceed that of rural districts. Carlberg states that the masculinity of towns in Livonia is 1078, as compared with 1053 in the rural districts. This is attributed to the fact that the town populations contain more Jews, Poles, and Russians, who all have a high masculinity.

It is clear that there is something in the conditions of country life which tends to the birth of a higher proportion of male children than is found in towns.

(9) *Social condition.*—Though no statistics on this subject have been published in this country, we are able to refer to evidence from other countries, and to supplement these by the record of Scotland for

1855. Swedish statistics referring to the years 1851-1860, state the masculinity in various classes of the population. (See Table LVI.)

Maurel, investigating the population of two rich streets in Toulouse, found that, of 225 couples 31 or 17 per cent. were sterile; and that, of 194 fruitful couples there was issue 147 male and 155 female, *i.e.*, a masculinity, in a presumably high social state, of

TABLE LVI.—*Masculinity. Social Condition. Sweden*, 1851-1860. *Total Births.*

Class.	Masculinity.
Nobles	983
Clergy	1086
Officials	1057
Commercial . . .	1050
Agriculturists . . .	1057

only 950. In the families where children were numerous, the later-born children showed the lowest masculinity, and in the families with only one child, the masculinity attained only the extremely low figure of 760. So far, it seems probable that the richer classes have a feeble masculinity. A confirmation of this is afforded by Maurel's details relative to a large town in which he obtained figures as to 186 couples belonging to two of the liberal professions. Of these, 35 or 18.8 per cent. were sterile, and 151 fecund. The issue of the latter counted 126 boys to 149 girls, showing a masculinity of 845.

We have analysed the births in Scotland in 1855 according to the proportion of the sexes born to

fathers of various occupations and of different social rank. The results are tabulated in Table LVII. The professional class includes the nobility and persons of independent means as well as the professions. The commercial group includes the merchants and shopkeepers. On comparing Tables LVI. and LVII. it will be seen that in each case the lowest

TABLE LVII.—*Masculinity. Social Condition. Scotland*, 1855. *Total Legitimate Births.*

Class.	Number of Births.	Masculinity.
I. Professional . .	2,877	1,032
II. Commercial . .	9,667	1,070
III. Agricultural . .	18,409	1,068
IV. Seafaring . . .	5,461	1,066
V. Working-classes .	49,427	1,037
VI. Occupation not stated	123	...
All . . .	85,964	1,049

masculinity figure appertains to the highest social class. It is not possible to say whether this feature would have remained constant in the Swedish figures had the nobles and clergy been amalgamated in one class. In both tables the masculinity of the agricultural class is high, and it is noteworthy that the seafaring population of Scotland also shows a high masculinity.

As further illustrative of the masculinity found in special classes of the population we may mention the work of other observers. Kisch analysed the figures relating to 556 marriages in regnant or aristocratic

European families. There were 1972 births, of which 1023 were boys and 949 girls. This gives a masculinity of 1077 which is distinctly high for the social rank of the parents.

Wall made a composite investigation in which he included 1200 families selected from the Royal Houses of Europe (120), Families of Princely Rank (27), the English Peerage (890), and the German Peerage (163). There were 6529 children in these families, and of these 3381 were males and 3148 females. This gives a masculinity of 1074. Orschansky publishes the masculinity of 2441 families having 13,277 children. He found that in the German peerage the masculinity was 1051, in German colonists 851, in the Russian peasantry 1147, in various Russian families 1020, and among the Jews 1000.

Düsing contrasts the high masculinity of the agricultural class with the low masculinity manifested by industrial occupations, and both he and Ploss note that those residing in mountainous regions have a high masculinity. The latter, indeed, states that at 500 feet above the sea-level the masculinity is 1059, at 1000-1500 feet it is 1073, and at 1500-2000 feet it becomes 1078.

The agricultural class appears to have a high masculinity in the new world as well as in the old, for it is specially noted by Wynne that in Kentucky in 1852 and in Virginia in 1853 the masculinity of this class was 1120 and 1140 respectively.

In conclusion, it is advisable to point out that the conflict of evidence, as to the masculinity of the births

belonging to the higher social classes, is largely dependent upon the relatively small numbers of such births. The universal agreement as to the high masculinity found amongst the agricultural population confirms the evidence given in a previous section as to the superiority in masculinity of rural over urban residents.

(10) *Season of the year.*—The suggestion has sometimes been made that the season of the year has an influence in determining the proportion of male and female births. With a view to investigating the value of this suggestion, we have calculated and brought together in Table LVIII. the masculinity observed among the births which occurred at different periods in Montpellier, Sweden and Finland, Prussia, Massachusetts, and Kentucky respectively.

These figures relate to places widely separate from one another, and differing considerably as to the number of births under observation. It will be observed that the maximum masculinity is found in each column in connection with a different month. The incidence of the minimum masculinity is likewise widely divergent. In none of the columns is there such regularity of progression as to indicate that any special season is particularly associated with an excess of male births. It is true that the Prussian figures suggest that midsummer and midwinter coincide with the highest masculinity. There is no confirmation of this in the other columns of the table.

TABLE LVIII.—*Masculinity. Season of the Year.*

Month of Birth.	Montpellier, 1772—1792. 25,064 Births.	Sweden and Finland, 1776—1795. 98,571 Births.	Prussia, 1872—1881. 10,674,254 Births.	Massachusetts, 1845—1849. 92,272 Births.	Kentucky, 1853. 24,403 Births.
January . . .	1057	1041	1063	1073	1080
February . . .	1085	1039	1063	1049	1071
March	1068	1034	1059	1077	1233
April	1002	1043	1060	1069	1130
May	1082	1034	1061	1112	973
June	1050	1042	1068	1078	1037
July	1056	1035	1068	1022	1144
August	1079	1054	1063	1058	1146
September . . .	1046	1050	1060	1021	1173
October . . .	1107	1041	1063	1086	1073
November . . .	1030	1047	1062	1114	1120
December . . .	1099	1054	1066	1075	1099
Total . . .	1064	1043	1063	1068	1106

If, as in Table LIX., we compare the births of winter—say November to February—with those of summer—say May to August—we find that the winter months show a higher masculinity than the summer months in three of the columns. In one column the summer masculinity is somewhat greater than that of the winter, and in the remaining case the figures are equal. Here we

TABLE LIX.—*Masculinity. Season of the Year. Births.*

	Montpellier.	Sweden and Finland.	Prussia.	Massachusetts.	Kentucky.
Nov. to Feb.	1067	1045	1063	1077	1094
May to Aug.	1067	1041	1065	1065	1074

have considered the months in which the births took place, but it is more important to compare the months in which conception occurred, seeing that the sex is undoubtedly determined a considerable time prior to birth. Table LX. has been prepared with the object of showing the masculinity among winter and summer conceptions respectively.

TABLE LX.—*Masculinity. Season of the Year. Winter and Summer Conceptions.*

Season.	Montpellier.	Sweden and Finland.	Prussia.	Massachusetts.	Kentucky.
Nov. to Feb.	1064	1048	1062	1068	1127
May to Aug.	1060	1037	1061	1075	1099

Here in four out of the five cases a somewhat higher masculinity is shown in respect of the winter conceptions. On the other hand the remaining case shows precisely the opposite. The evidence is conflicting, and we may be justified in concluding that the season exercises no definite influence on the sex of conceptions. A high masculinity may occur at any period of the year.

(11) *National calamities.*—Such national calamities as war and pestilence are believed to exert an influence on the masculinity of the national births in the years immediately following the cessation of their ravages. Thus it is asserted that a nation, depleted by war of a considerable number of males in their prime, will develop a high masculinity in the births of succeeding years in order to compensate for this loss. It is well established that at the conclusion of a war the marriage rate rises, owing partly to the marriages of soldiers returned from the war, and partly to more general prosperity. As a result, it is also customary to find an increase in the number of births, but it is more difficult to find statistical expression of an influence on the masculinity of these births. Felkin records that among the Waganda, a Central African tribe, the effect of war is to increase the female births, and to lower the masculinity in the victorious party. This comes about through the capture of the women of the defeated tribe. These imported women are mostly fecund, but their first issue is usually a female. While the masculinity of the pure Waganda first births is 980, that is slightly negative, the masculinity of the

first births of the imported women is only 196, that is intensely negative. In subsequent pregnancies of these latter women the masculinity of the births is 730. Felkin attributes the great excess of female births among the first-born to the exhausted and depressed condition of the women recently captured.

As to the effects of a severe pestilence on the masculinity, evidence has been adduced by Emerson in regard to the epidemics of cholera in Philadelphia and Paris in 1832. In the former city the cholera was most severe in August and September 1832, and the births of April and May 1833 exhibited an excess of female births in substitution for the positive masculinity which was the common experience. In the whole six months, April to September 1833, there were more females than males born. In Paris cholera was most fatal early in 1832; and the births, nine months later (December 1832), showed a negative masculinity. Moreover, for the whole year 1833 the legitimate births showed only a masculinity of 1035 instead of the usual figure of over 1060, while the illegitimate births were actually negative in masculinity. The cholera was most severe on the lower classes which provide most of the illegitimate births.

(12) *Parental age.*—In 1829 Hofacker propounded the theory, based upon his own investigations, that the proportion of the sexes at birth depends upon the relative ages of the parents. He considered that a majority of females are born when the mother is older than, or equal in age to, the father, and that a majority of males are born when the father is the elder parent.

Further, he advanced the view that the excess of female or male births increases as the difference between the ages of the parents extends. This theory received corroboration from Sadler in 1830 as a result of an investigation into the records of the English Peerage. It is consequently known as the Hofacker-Sadler law, and until more recent researches it received considerable credence. Sadler advanced the additional proposition that the ordinary excess of male births corresponds to the excess of mortality among males, from birth to the age of marriage, as compared with the mortality among females in the same period of life. The result of this correlation provides that an equal number of each sex should reach marriageable age.

In both of these investigations the number of births under observation was small—about 2000 in each case—and as registration of births in European countries has since become general it is possible to ascertain how far the statistics now available support the theory of Hofacker and Sadler.

In England the ages of the parents have never been recorded in the birth registers, so that there are no means of obtaining statistics on this point with regard to the general population. In Scotland, however, in the first year of registration (1855) the ages of the parents were recorded. The Scottish registers of 1855, therefore, are the only source in Great Britain from which a large volume of statistics are obtainable for the investigation of this question. From these registers we have obtained materials for

the preparation of the following tables. For comparative purposes we include the corresponding figures obtained by others in similar investigations abroad.

Considering first the ages of the parents separately, we submit in Table LXI. the masculinity observed according to the ages of the fathers (in each quinquennial

TABLE LXI.—*Masculinity according to the Age of the Father.*

Ages.	Scotland, 1855.	Alsace-Lorraine, 1872–1873.	Norway, 1871–1875.	Berlin.	Oldenburg.	Vienna, 1895 and 1896.	France, 1892.
15—19	1150	1800	1037	1174	1053	...	995
20—24	1019	1080				1144	
25—29	1027	1080	1075	1083	1083	1060	1010
30—34	1077	1059	1058	1041	1066	1057	
35—39	1066	1046	1045	1024	1058		1050
40—44	1033	1062	1045	1016	1062	1012	
45—49	1049	1079	1045	1020	1058		
50—54	1045	1058	1024	1012	1083	1202	1050
55—59	1165						
60 and over	940						
All . .	1049	...	...	...	...	1061	1050

group of ages), in Scotland, Alsace-Lorraine, Norway, Berlin, Oldenburg, Vienna, and France.

Although the number of births upon which these figures are based is in each case considerable, the masculinity frequently fluctuates, and shows no sign of any regular variation in magnitude in relation to the age of the father.

Similarly, in Table LXII. are given the figures for the masculinity according to the age of the mother. Those relating to Scotland show an ascending

masculinity up to the age-group 30-34, followed by a brief decline. Mothers aged 40 and upwards exhibit a recrudescence of masculinity, a feature which is also manifest in certain of the other localities included in

TABLE LXII.—*Masculinity according to the Age of the Mother.*

Ages.	Scotland, 1855.	Alsace-Lorraine 1872—1878.	Norway.	Berlin.	Oldenburg.	Vienna, 1895 and 1896.	France, 1861—1870.	France, 1892.
15—19	996	1124	1062	1049	1079	1063	1090	1070
20—24	1038	1061					1058	1050
25—29	1046	1054	1045	1062	1058	1073	1080	
30—34	1066	1067	1066	1053	1075	1057	1070	1040
35—39	1041	1061	1045	1041	1070		1057	
40—44	1065	1078	1079	1062	1049	982	1066	1060
45—49	1055						1055	
All .	1049	1049	...	...	...	1061	...	1050

the table. These places, however, do not indicate a comparatively regular ascent of masculinity among the younger mothers, such as is shown in the case of Scotland.

The general trend of experience, as shown in these two tables, completely confirms the conclusions arrived at by Sadler, that "no law of the proportion of the sexes at birth can be traced by depending merely upon the ages of the parents separately."

Next we may consider the ages of the parents in combination, and observe the masculinity of the offspring. Table LXIII. shows the masculinity for the legitimate births which occurred in Scotland in 1855, when grouped with reference to the ages of both

parents. Tables LXIV., LXV., LXVI., and LXVII. show corresponding figures for Alsace-Lorraine, Vienna, France, and New South Wales, respectively. In the French table the fathers are gathered into decennial groups of age which differ from those used for the mothers. The Viennese figures present another method of grouping, while the New South Wales table gives the masculinity for individual ages and not for groups of ages.

TABLE LXIII.—*Masculinity according to the Combined Parental Ages. Scotland*, 1855. *Legitimate Births.*

Ages of Mothers.	Ages of Fathers.								
	15—19.	20—24.	25—29.	30—34.	35—39.	40—44.	45—49.	50—54.	55—59.
15—19	(1024)	1084	825	(689)	...	...	...	...	...
20—24	...	1028	1022	1093	1055	1121	...	...	...
25—29	...	986	1037	1050	1083	1044	1084	(1524)	...
30—34	...	841	1037	1092	1052	1082	1054	908	(1319)
35—39	...	...	983	1117	1065	978	1049	997	1250
40—44	...	...	...	(1138)	1118	1060	1071	1016	1052
45—49	...	...	...	...	...	(1122)	994	(1200)	(1050)

Note.—No figure given where less than 100 couples in the group, and figures bracketed when less than 200 couples in the group.

TABLE LXIV.—*Masculinity according to the Combined Ages of the Parents. Alsace-Lorraine*, 1872-1873 (*Stieda*).

Ages of Mothers.	Ages of Fathers.							
	15—19.	20—24.	25—29.	30—34.	35—39.	40—44.	45—49.	50 and over.
15—19	...	1085	1041	1313	...	...	...	...
20—24	...	1075	1070	1051	1024	908	...	...
25—29	...	1082	1091	1025	1025	1049	1175	1122
30—34	...	1222	1076	1083	1057	1032	1072	1000
35—39	...	...	1035	1086	1039	1081	1081	1043
40 and over	...	...	...	1082	1101	1077	1059	1086

TABLE LXV.—*Masculinity according to the Combined Ages of the Parents. Vienna*, 1896 (*Rosenfeld*). *Legitimate Live Births.*

Ages of Mothers.	Ages of Fathers.					
	Under 25.	25—30.	30—40.	40—50.	Over 50.	All.
Under 20	...	1036	...	...	...	1161
20—25	1133	1038	1079	...	...	1075
25—30	1084	1047	1064	1196	...	1065
30—40	...	995	1085	956	1808	1067
Over 40	...	...	817	1121	559	954
All .	1127	1037	1070	1040	1255	1062

TABLE LXVI.—*Masculinity according to the Combined Ages of the Parents. France*, 1892 (*Turquan*).

Ages of Mothers.	Ages of Fathers.			
	Under 25.	25—35.	35—45.	45 and over.
Under 20	1000	1100	1070	1320
20—30	1040	1060	1050	1040
30—40	1150	1040	1050	1050
40—50	880	1060	1070	1060
50 and over	750	640	870	670

TABLE LXVII.—*Masculinity according to the Combined Ages of the Parents. New South Wales*, 1891-1900 (*Coghlan*).

Age of Mother.	Age of Father.						
	20.	25.	30.	35.	40.	45.	50.
20	949	1041	1110	1174	1232	...	...
25	...	1070	1088	1092	1088	1033	898
30	...	1058	...	1083	...	1066	...
35	...	...	1037	1058	1075	1088	1092
40	...	...	...	1058	...	1079	...
45	...	...	...	681	818	923	1008

Consideration of these five tables, both separately and in conjunction with one another, does not clearly show that the proportion of the sexes at birth follows any law based upon the absolute ages of the parents.

Finally, let us examine the masculinity when the births are grouped according to the number of years of difference between the ages of the parents. It was in this direction that Hofacker and Sadler believed that they found the main law of the proportion of the sexes at birth.

Sadler's figures are given in Table LXVIII., and side by side with them the corresponding figures from

TABLE LXVIII.—*Masculinity according to the Relative Ages of the Parents.*

The Father being as regards the Mother	English Peerage. *Sadler.* 2,008 Births.	Scotland. 85,964 Births.	German Peerage, etc. *Orschansky.* 18,277 Births.	European Aristocracy. *Kisch.* 1,972 Births.	Norway. *Schumann.* 198,764 Births.	Vienna. *Rosenfeld.*
Younger	865	1035	1000	1052	...	1151
Same age	947	1049	1000	809	...	1065
Older, 1—5 years	1037	1048	970	1038	1039	988
„ 6—10 „	1287	1051	940	1068	1055	
„ 11—15 „	1475	1067	1100	1137	1023	1061
„ 16—20 „	1600	1058	1180	1221	1074	
„ Over 20 „	1667	1118			1026	

our Scottish investigation, and those obtained by Orschansky, Kisch, Schumann, and Rosenfeld. The Scottish and Norwegian figures are based upon much the largest number of births, and each deal with a whole

nation in contrast to special classes of the population to which most of the other figures refer. The Scottish births, when grouped in this manner, do appear to some extent, though not without irregularity, to show the same tendency as was found by Sadler, viz., an increase in the masculinity according to the excess of the age of the husband over that of the wife. A closer agreement with Sadler's conclusions is found in the observations of Kisch, but it should be noted that the total births analysed are small in number. No confirmation is found in the more numerous data of Orschansky, Schumann, and Rosenfeld, and the same is true of the following table given by Berner, based upon no fewer than 213,224 Scandinavian births. Indeed, in the latter case, precisely the opposite feature appears. The highest masculinity occurs when the mother is the elder by 1-10 years; there is steady decrease when the parents are of equal age, and a progressive decrease as the age of the father exceeds that of the mother.

Father	over 10 years older	1035
,,	1-10 ,, ,,	1046
,,	equal in age	1062
Mother	1-10 years older	1075
,,	over 10 years older	1041

If the births are divided into only three large groups, viz., (1) father older, (2) parents equal in age, (3) mother older, figures may be quoted from many sources, as shown in Table LXIX.

Such a table ought to afford definite confirmation

TABLE LXIX.—*Masculinity according to the Relative Ages of the Parents.*

Observer.	Number of Births.	Source of Data or Locality.	Date.	Relative Age of Parents.			Total Masculinity.
				Father Older.	Parents equal Age.	Mother Older.	
Hofacker	1,996	Tübingen	1829	1,178	920	906	1,075
Sadler	2,068	English Peerage	1830	1,214	948	865	1,147
Goehlert	4,584	Vienna (Aristocracy)	...	1,082	933	826	1,053
Legoyt	52,311	Paris	1854-55	1,045	1,021	975	1,030
Boulenger	6,006	Calais	1833-52	1,100	1,079	1,016	1,079
Noirot	4,000	Dijon	...	997	...	1,160	1,035
Breslau	8,084	Zurich	...	1,039	1,031	1,176	1,066
Stieda	100,590	Alsace-Lorraine	1872-73	1,050	1,095	1,084	1,063
Berner	267,946	Sweden	...	1,046	1,062	1,075	1,060
Rosenfeld	...	Vienna	1895	1,022	1,065	1,151	1,062
Oehrn	14,818	Livonia	1834-81	1,033	941	1,008	1,019
Boeckh	156,761	Berlin	1878-81	1,052	1,046	1,026	1,047
Boudin	...	(Paris)	1863	1,092	945	910	...
Schumann	198,764	Norway	1871-75	1,045	1,059	1,069	1,051
Lewis	85,964	Scotland	1855	1,052	1,049	1,035	1,049

of the Hofacker-Sadler law if this law expressed an invariable relation between masculinity and the relative age of the parents. Examination of the table shows, however, that no unanimity exists in the experience of these localities. While the observations of Goehlert, Legoyt, Boulenger, Boeckh, Boudin, as well as our own, may be taken as confirming those of Hofacker and Sadler, the investigations of Stieda, Berner, Rosenfeld, Schumann, and Noirot not only do not agree with the former, but on the contrary suggest a law precisely the reverse. Additional weight is to be attached to the latter researches on account of the larger numbers of births under consideration. In these circumstances we cannot regard the Hofacker-Sadler law as proved ; nay, more, notwithstanding that the Scottish figures do support the existence of such a law, the balance of evidence tends to suggest that there is no such law of universal application.

General conclusions as to masculinity.—Having referred to so many conditions as characterised by variations in masculinity, it may be advisable to sum up briefly the conclusions to which these variations lead. These conclusions are :—

(1) That certain nations and races exhibit a high, and others a low, masculinity.

(2) That masculinity does not remain stationary in each nation or race, but may rise or fall in the course of years.

(3) That cross-breeding raises masculinity.

(4) That emigration lowers the masculinity of

the Latin races, but does not so definitely affect the Anglo-Saxon colonist.

(5) That masculinity does not vary directly with the birth-rate, though its movements are often coincident with the fluctuations of the latter. The recent decline of the birth-rate has been accompanied in many cases by a fall in masculinity.

(6) That the legitimate and illegitimate masculinity bear different relations to each other in different countries. Legitimacy or illegitimacy has little influence on masculinity, for in some countries the legitimate and in other countries the illegitimate masculinity is the higher. On the whole the legitimate masculinity is generally superior.

(7) That stillbirths exhibit a very high masculinity in accordance with the higher mortality affecting male births during parturition.

(8) That masculinity is higher in first than in subsequent births.

(9) That masculinity shows no constant high level in multiple births as compared with single issue.

(10) That masculinity in urban districts is always less than it is in rural districts. Either country life increases masculinity or town life diminishes it.

(11) That masculinity is not constant in all social ranks, and is always high in populations which live an open-air life. The agricultural and seafaring classes have a high masculinity, but the upper classes of society frequently show a low masculinity.

(12) That the season of the year at which conception takes place does not affect masculinity.

(13) That evidence is wanting as to the effect of national calamities on masculinity, but it appears possible that such effects might vary according to the nature of the calamity. The recovery from disease or war might influence masculinity in opposite directions.

(14) That masculinity is not directly dependent on either the absolute or the relative ages of the parents, though these may be significant of physiological vigour, and hence account for the correlation which has sometimes been observed between the ages of the parents and the masculinity of their issue.

CHAPTER XIV

STERILITY

THE previous chapters having dealt with fruitful marriages, it is now obligatory to say something of those marriages which are sterile. The registers of births disclose nothing concerning sterile marriages, but, by comparison of the numbers of marriages with the numbers of first births, some deductions may be made as to the proportion of marriages which are sterile. The consideration of sterility is made as concerns the wife only, and no figures bearing on sterility of the husband are produced. As no information is available as to abortions, and as stillbirths are not registered in Scotland, wives who become pregnant, but do not succeed in bearing a living child, are in these statistics classed as sterile. They are not really sterile, and yet they do not add a living unit to the population. The term sterility, as here used, denotes the absence of living registrable issue and connotes experience of married life at an age suitable for reproduction. It is the sterility of wives at possible child-bearing ages which is investigated in Table LXX. There were 19,680 brides in 1855, and there were 16,176 mothers of

first-birth children. Approximately, therefore, 3504 wives were sterile, *i.e.*, 17.8 per cent. or one in 5.62 appeared in the marriage, bnt not in the birth, registers. But 330 of the brides were married at ages above 45 years when sterility rather than fertility is the rule, so

TABLE LXX.—*Variations of Sterility according to the Ages of the Wives at Marriage.*

Ages of Wives at Marriage.	Number of Wives Married in 1855.	Wives-Mothers of First Children in 1855.	Sterile Wives.	Percentage Sterile.	Proportion Sterile, 1 in
15—19	3,097	2,613	484	15.63	6.40
20—24	8,119	7,996	123	1.51	66.00
25—29	4,958	3,844	1,114	22.47	4.45
30—34	1,780	1,205	575	32.30	3.09
35—39	908	444	464	51.10	1.96
40—44	488	64	424	86.89	1.15
45—49	202	9	193	95.54	1.05
50—54	88	1	87	98.86	1.01
55 and over	40	0	40	100.00	1.00
All ages .	19,680	16,176	3,504	17.80	5.62

that considering only those married under the age of 45 the percentage of sterile wives is reduced to 16.45 or one in six wives proves infertile. The variations of sterility are mainly due to the age at marriage. The table shows that nearly all wives married at 20-24 years are fertile, only $1\frac{1}{2}$ per cent. being sterile. Brides of 15-19 show a sterility of 15 per cent., but nevertheless come next in order. It is possible that their sterility is due in part to immaturity, and that this percentage is apparently higher than the reality. Wives married at ages subsequent to 24 show higher degrees of sterility than all those married at

younger ages. Their sterility increases as the age at marriage advances, until sterility finally becomes universal at the end of the reproductive period of life. One in every three wives married at 30-34 is barren, and more than half of the wives married at ages above 34 are sterile.

The general law of sterility may be stated thus—in a mass of brides of all ages those married above 24 show an increasing proportion of sterile individuals as the age at marriage is greater.

Next we consider the question of how soon after marriage a wife, who has not proved herself fecund, may be regarded as likely to be permanently sterile. Duncan stated this period as three years, and though our figures for the whole country differ very considerably from his, they are probably more accurate in that they embrace a much larger experience, and are less irregular in sequence.

Table LXXI. gives in parallel columns both sets of figures. Three per cent. of fecund brides married at 20-29 postpone the demonstration of their fecundity for more than three years after marriage. This is a somewhat smaller percentage than is exhibited by those brides of 15-19 who ultimately prove their fecundity. From the age of 30 upwards the percentage of fecund wives showing this postponed fecundity increases as the age at marriage advances. It appears that, varying with the age at marriage, from 3 to 10 per cent. of the fruitful wives have no children during the first three years of married life. When a period of five years has elapsed since

marriage, only 1 to 2 per cent. of the fruitful mothers have not yet given birth to a child. This is true irrespective of the age at marriage, as shown in

TABLE LXXI.—*Postponed Fecundity. Scotland*, 1855.

Age of Wife at Marriage.	Percentage of Fecund Wives showing First Fertility only after Three Years of Married Life.	
	Edinburgh and Glasgow, 1855. *Duncan.*	Scotland, 1855. *Lewis.*
15—19	9.7	3.90
20—24	6.2	3.25
25—29	7.7	3.22
30—34	10.7	6.89
35—39	15.6	7.88
40—44	10.0	9.38
45—49	...	11.11
All ages .	7.7	3.78

Table LXXII., which contains the percentage of fruitful marriages which are fertile (1) within three years, (2) from three to five years, and (3) more than five years after marriage.

A better method of comparison consists in the study of the total marriages, and not only of those which are fruitful. The later columns of Table LXXII. contain the materials for a comparison on this basis. It shows, with regard to the total marriages, the percentages which are fruitful in the periods specified, and also the percentages which prove permanently sterile. It discloses the fact that of all brides only .5 to 1.5 per cent. eventually prove

fertile though sterile during the first five years of matrimony. From 1 to 3 per cent. of the total marriages show their primary fertility from three to

TABLE LXXII.—*Postponed Fecundity. Scotland,* 1855. *Total Marriages,* 19,680. *Fruitful Marriages,* 16,176.

Age of Wife at Marriage.	Fruitful Marriages.			Total Marriages.			
	Within 3 Years.	3—5 Years.	Over 5 Years.	Fruitful within 3 Years.	Fruitful in 3—5 Years.	Fruitful in Over 5 Years.	Sterile.
15—19	96.10	2.14	1.76	81.08	1.81	1.48	15.63
20—24	96.75	1.98	1.27	95.28	1.95	1.26	1.51
25—29	96.78	2.32	0.90	75.03	1.80	0.70	22.47
30—34	93.11	4.90	1.99	63.03	3.32	1.35	32.30
35—39	92.12	6.76	1.12	45.05	3.30	0.55	51.10
40—44	90.62	9.38	...	11.88	1.23	...	86.89
45—49	88.89	11.11	...	3.96	0.50	...	95.54
All ages .	96.22	2.47	1.31	79.09	2.03	1.08	17.80

five years after marriage. The proportion of brides, who are fertile within the first three years after marriage, is high at the younger ages, and declines steadily as the age at marriage advances. There is an irregularity in the sequence in the case of brides married at 20-24, of whom 95.28 per cent. are shown as fertile within three years. This figure is abnormal, and due to the fact that it has been necessary to compare the births with the marriages of the same year, and not with the marriages to which these births actually belonged. The proportion of marriages, in which the bride belonged to this age-group, was considerably lower in 1855 than in an average year,

while the proportion, in which her age was 15-19, was above the average.

This Table (LXXII.) may be compared with Table LXXIII., which contains corresponding percentages calculated from materials extracted by Dr Sprague from the records of the British Peerage. The number of marriages included in the research was 498, and of these 407 were fruitful. The

TABLE LXXIII. — *Postponed Fecundity. Peerage (Sprague). Total Marriages,* 498. *Fruitful Marriages,* 407.

Ages.	Percentage of Fruitful Marriages.			Percentage of Total Marriages.			
	Fruitful within 3 Years.	3—5 Years.	Subsequently.	Fruitful within 3 Years.	3—5 Years.	Subsequently.	Sterile.
15—19	91.66	4.17	4.17	80.73	3.67	3.67	11.93
20—24	92.08	3.96	3.96	78.81	3.39	3.39	14.41
25—29	90.91	2.60	6.49	76.09	2.17	5.43	16.31
30—34	95.83	4.17	...	67.65	2.94	...	29.41
35—39	85.71	...	14.29	40.00	...	6.67	53.33
40 and over	100.00	...	...	8.33	...	...	91.67

percentages are first shown in respect of the fruitful marriages only, and in the later columns in respect of the total marriages. In this case, of course, the marriages dealt with were traced throughout, and the births were compared directly with the marriages from which they resulted. In these selected cases the percentages of the fruitful marriages and of the total marriages which exhibited a fecundity postponed for more than five years after marriage, were higher

than in Scotland in 1855. On the other hand, a smaller percentage of the fertile peeresses were fruitful within three years of marriage. From both tables we learn that the proportion of sterile marriages increases as the age at marriage advances. The irregularity in Table LXXII. at ages 20-24 has been already explained.

From the Scottish figures, taking all ages together, it appears that when a woman has been married five years without giving birth to a child, the probability that she will not conceive is about 17 to 1.

BIBLIOGRAPHY

ANCEL, M. P.—*Comptes rendus Soc. biol.*, Paris, 1903, lv., p. 1049.

ANSELL, C.—*Statistics of Familes in Upper and Professional Classes*, 1874.

BERNOULLI.—*Annales d'Hygiene*, 1838.

BENDA, C.—*Deutsche Med. Woch.*, 1903, xxix., s. 708.

BERTHILLON.—*Elements du Demographie*, 1896, pp. 33 and 43; *Dict. Ency.*, on "Natalité"; *B. M. J.*, 1904, ii., p. 1116.

BERNER, H.—*En biologisk Studie*, Christiania, 1883.

BIDDER, FR.—Thesis, Mitau, 1893.

BLOCK.—*Statistique de la France*, 2nd ed., 1875.

BODIO, L.—*Movimento della popolaziona, confronti internazionale*, Roma, 1895.

BOECKH.—*Statistisches Jahrbuch der Stadt*, Berlin.

BOUDIN.—*Bull. Soc. d'Anthrop de Paris*, 1862, iii., pp. 591-597; *Gaz. Med. de Paris*, 1863, 3rd ser., xxxiv., pp. 137-139.

BORN, G.—*Breslauer Aertzliche Zeitsch*, 1881-1882, 59, ss. 2-23.

BOULENGER.—Quoted by Stieda.

BRESLAU.—Quoted by Stieda.

BROWN, S.—*Assurance Magazine and Journ. Inst. of Actuaries*, ix., Oct. 1852, p. 17.

CAZALIS, E.—*Presse Méd.*, Paris, 1896, No. 78, pp. 359-361.

Census Reports, 1851 and 1861.

CHATHAM, J.—*Journ. Inst. Act.*, London, 1888, xxvii., pp. 37-48.

COGHLAN, T. W.—*Decline in the Birth-rate of New South Wales*, Sydney, 1903.

CORBAUX, F.—*The Natural and Mathematical Laws concerning Population, Vitality, and Mortality*, 1833.

CURTIS.—*Seasonal Incidence of Births*, Mass., 1845-49, 8th Registration Report, Mass., 1849; 2nd Registration Report, Rhode Island.

DAREMBURG, C.—*Rev. Scient.*, Paris, 1881, 3rd ser., i., pp. 747-753.

DAY, A.—*Journ. Inst. of Actuaries*, 1865, vol. xii., p. 185.

DELAUNAY, G.—*Rev. Scient.*, Paris, 1885, xxxvi., pp. 433, 466.

DENMARK.—*Medical Organisation, Hygiene, and Demography*, Official, 1891.

DOEDERLEIN.—*Deutsche Revue*, 1902.

DUCHATELLIER.—*Annales d'Hygiene*, Paris, 1845, xxxiv., p. 336.

DUNCAN, J. M.—*Fecundity, Fertility, and Sterility*, Edin., 1871, 2nd ed.; Gulstonian Lectures, *Brit. Med. Journ.*, 1883, i.; *Trans. of the Roy. Soc. of Edin.*, vol. xxiii., p. 475; *Trans. of the Roy. Soc. of Edin.*, vol. xxiv., pt. 2, pp. 315-325.

DUMONT, A.—Ass. pour l'avancement des sciences, 1893, Congr. at Besancon.

DÜSING, C.—*Das Geschlechts-Verhältniss der Geburten in Preussen*, 1875-87. *Int. Centralbl. für d. Phys. u. Path. d. Harn. u. Sex. Org.*, Hamburg and Leipzig, 1891, iii., pp. 99-101; 1890, ii., pp. 107-346. *Die Regulierung des Geschlechts-Verhältnisses*, 1884.

EMERSON.—*Proceedings of American Phil. Soc.*, vol. v., 1854; *American Journ. Med. Science*, 1848, vol. xvi., pp. 78-85.

FARR.—27th Annual Report of Registrar-General, England, p. 20; 40th Annual Report of Registrar-General, England, p. 37.

FELKIN.—*Edin. Med. Journ.*, 1886, p. 233.

FÜRST, C.—*Archiv für Gynäk.*, Berlin, 1886, xxviii., 14-31.

GACHE, S.—*Climatologie médicale de la République Argentine*, p. 164.

GALTON, F.—*Journ. Stat. Soc.*, London, 1873, xxxvi., pp. 19-26; *Proc. Roy. Soc.*, London, vol. 55.

GEDDES and THOMSON.—*Evolution of Sex.*

GEISSLER, A.—*Zeitschrift d. K. Sachs. statist. Bureau*, Dresden, 1889, xxxv., pp. 1-24.

GIRON DE BUZAREIGNES, C. G.—*Rev. Méd. franc. et étrang.*, Paris, 1836, iii., p. 155; 1837, iv., p. 326; 1838, ii., p. 382; *De la génération*, Paris, 1828.

GOEHLERT, V.—*Zeitschrift f. Ethn.*, Berlin, 1881, xiii., pp. 117-129; *Wiener Klinik*, 1890, p. 251.

GOTTSTEIN, A.—*Zeitschrift für Hygiene*, Leipzig, 1897, xxvi., pp. 337-352.

GOURRIER, H. M.—*Laws of Generation and Sexuality.*

GUIARD, F. P.—*Rev. critique sur les lois de la formation des sexes*, Paris, 1903.

HENDRIKS.—*Journ. Stat. Soc.*, 1862, vol. xxv.

HIS, W.—*Archiv für Anthrop.*, Bd. iv.-vi.

HOFACKER and NOTTER.—Quoted by Stieda.

HOFACKER.—*Annales d'Hygiene*, quoted by Brown, S. 1829; *Ueber die Eigenschaften, welche sich bei Menschen und Thieren auf die Nachkommen vererben*, Tubingen, 1828.

KISCH, E. H.—*Centralbl. für Gynäk.*, Leipzig, 1887, xi., pp. 49-51; *Brit. Med. Journ.*, 1887, i., p. 349; *Wien. Klinik*, 1887, xiii., pp. 215-246.

KOLLMAN, P.—*Allgem. Stat. Archiv*, 1890.

KÖRÖSI, (Buda-Pesth.)—*Trans. Phil. Soc.*, 1893; *Public Health*, 1895, vol. viii., No. 3; *Phil. Trans. Roy. Soc.*, London, 1895, vol. 186, p. 781.

LEGOYT.—*Statistique de la France*, 2nd ser., t. iv., Strasburg, 1857, p. 25.

LENHOSSEK.—*Das Problem der geschlechts-bestimmenden Ursachen*, Jena, 1903.
LUND.—Quoted by Maurel.
MARTIN, F.—*Journ. Stat. Soc.*, London, 1877, xl., pp. 593-613.
MAUREL.—*Rev. Scient.*, series 4, xix., Mars 21 and April 4, 1903; *Congres de Rouen pour l'avancement des Sciences*, 1883; *De la dépopulation de France, étude sur la Natalité*, Doin, Paris, 1896.
MILNE, J.—Extract from the Annuities and Assurances, 1815, pp. 489-582.
MOLLIARD, M.—*Comptes rendus Acad. des Sc.*, Paris, 1898, cxxvii., pp. 669-671.
MULHALL.—*Dictionary of Statistics*, 4th ed., 1899.
NEWSHOLME, A.—*Vital Statistics*, 1899.
OEHRN, E.—*Biostatik dreier Landkirchspiele Livlands in den Jahren* 1834-81, Dorpat, 1883.
OGLE, W.—*Journ. Roy. Statist. Soc.*, London, 1890, liii., pp. 253-289.
ORSCHANSKY.—*Die Vererbung*, Stuttgart, 1903.
PLOSS, H.—*Das Weib in der Natur-und Völkerkunde*, Leipzig, 1885.
PLOSS-BARTELS.—*Das Weib in der Natur-und Völkerkunde*, 7th Aufl.
QUETELET. — *Sur l'homme, Recherches sur la Reproduction et la Mortalité.*
RABBINOVICZ, J. M.—*La médecine du Thalmud* (trad. par. J. M. R., Paris, 1879).
RAUBER, A.—*Der Ueberschuss an Knabengeburten und seine biologische Bedeutung*, Leipzig, 1900.
Registrar-General's Reports—England, Scotland, and Ireland.
Report of the Registrar-General of Jamaica, March 31, 1903.
Report of the Royal Commission on the Decline of the Birth-rate in New South Wales. Sydney, 1904, vol. 1.
RICHET, C.—*Revue Scientifique*, Paris, 1891, xlvii., 19-21; *Rev. d'Anthrop.*, Paris, 1880, 2nd ser., iii., pp. 203-212.
ROBIN.—*Gaz. Méd. de l'Algerie*, 1879, xxiv., pp. 26-28; *Rev. prat. d'obst. et de gynec.*, Paris, 1903, xxi., pp. 106-121; *Journ. de Méd. de Paris*, 1903, 2nd ser., xv., pp. 91-96.
ROSENFELD, S.—*Wien. Med. Blätter*, 1898, xxi., 600-617.
RUBIN.—*Journ. Roy. Statist. Soc.*, 1900 (63), p. 596.
RUBIN and WESTERGAARD.—*Statistik der Ehen auf Grund der socialen Gliederung der Bevölkerung*, Jena, 1890.
SADLER.—*Law of Population*, London, 1830.
SCHUMANN, A. L.—*Die Sexualproportion der Geborenen*, Oldenburg, 1883.
SCHULTZE, B. S.—*Brit. Gyn. Journ.*, 1903-4, xix., pp. 80-83; *Centralbl. f. Gynäk.*, Leipzig, 1903, xxvii., 1-4.
SELIGSON, E.—*Willkürliche Zeugung von Knaben oder Mädchen*, München, 1895.
SHURTLEFF.—14th Registration Report, Massachusetts.

SPRAGUE, T. B.—*Journ. Inst. Actuaries*, London, 1885, xxv., pp. 160-184; *Proc. Roy. Soc. Edin.*, 1886-87, xiv., pp. 327-346; Rept. Brit. Ass. Adv. of Science, 1884, London, liv., p. 866.

STARKWEATHER, G. B.—*Law of Sex*, London, 1883.

STARK, J.—*Journ. Stat. Soc.*, London, 1851, xiv., pp. 48-87; *Edin. Med. Journ.*, 1869-70, xv., pp. 481-593.

STIEDA, W.—*Das Sexualverhältniss bei Geborenen*, Strasburg, 1885.

TAIT, P. G.—*Trans. Roy. Soc. Edin.*, xxiv., pt. 2, pp. 481-490.

THOMSON.—See Geddes.

TURQUAN, V.—*Revue Scientifique*, Paris, 1896, 4th series, v., pp. 8, 167.

WALL.—*Lancet*, 1887, i., pp. 261-307.

WAPPAEUS.—*Allgemeine Bevölkerungs-statist.*, Leipzig, 1861.

WATASE, S.—*Journ. of Morphol.*, 1892, vi., pp. 481-491.

WELTON.—*Journ. Roy. Stat. Soc.*, 1900, vol. 63, pt. 4, p. 527.

WESTERGAARD.—See Rubin, and Denmark.

WILLBUR.—Annual Report on Vital Statistics of Michigan, 1894, p. 119.

WILCKENS, M.—*Untersuchungen über das Geschlechts verhältniss*, Berlin, 1886.

WUNSCHE.—*Der babylonische Talmud*, Leipzig, 1889, Tract. Niddah, chap. 19, p. 185.

WYNNE, J.—Report on Vital Statistics of the United States, made to the Mutual Life Insur. Co. of New York, 1857.

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